

Annapolis at War

POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT



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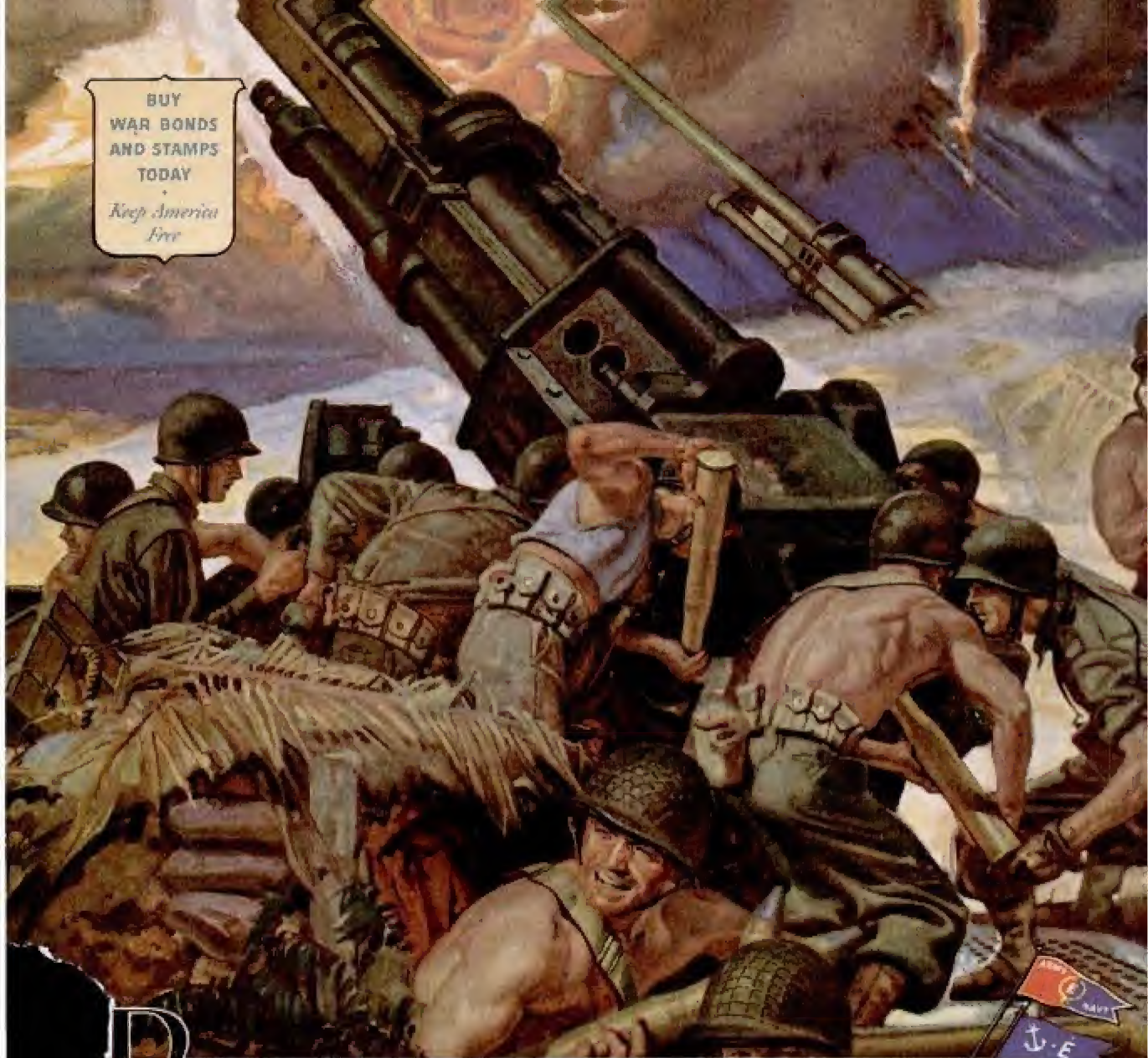
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BUY UNITED STATES
WAR SAVINGS
BONDS AND STAMPS

BUY
WAR BONDS
AND STAMPS
TODAY

*Keep America
Free*



Body blow *by Fisher*

First in the automotive industry to fly the Navy "E" with three stars, Fisher has also been awarded the Army-Navy "E" for its ahead-of-schedule tank production.

It's bad news for enemy planes—this 90-millimeter anti-aircraft gun.

Here are a few notes for the record—time and place deleted.

A four-gun battery of these "nineties" brought down sixteen high-altitude bombers in twelve days.

"Body blow" was right!

Fisher is proud of this gun, although Fisher did not make *all* of it. Like most armament, it is a fine example of the cooperative spirit of American industry, with many manufacturers contributing to the finished product.

Perhaps Fisher's most notable contribution to this national effort is craftsmanship well directed. Precision men and precision methods help to give Fisher tanks, bombers, anti-aircraft guns and delicate aircraft instruments a technical plus. All the unusual crafts and special skills we have developed are trained on this target.

In war as in peace, craftsmanship is our goal. And we do our best to make the Fisher name on armament mean an ace in the hole when the going gets tough.



armament
BODY BY

Fisher

D I V I S I O N O F G E N E R A L M O T O R S

"PERISCOPE ON THE STARBOARD QUARTER!"



IN SUBMARINE-infested waters, a speeding destroyer must be able to change its course in a split-second—to drop its deadly ashcans on enemy U-boats.

The secret of the destroyer's great *speed* and *maneuverability* is the tremendous power of its turbines, operating at steam temperatures *high enough to make the turbine blades glow!*

This introduces a difficult problem in turbine construction. The highly heated metal parts "creep" under stress. The metallic grains slowly slide over each other. The metal tends to *flow* out of shape.

Excessive "creep" would quickly destroy the turbine—due to collision between the blades and other parts of the turbine, which are spaced only a *fraction of an inch* apart for maximum power.

Westinghouse first introduced the steam turbine in the United States and has built thousands during the past 45 years. And much of the success of Westinghouse steam turbines is due to the intensive study of "creep" by scientists in the Westinghouse Research Laboratories.

As a result of the "know how" gained through this research, the "creep" in some turbine metals has been reduced to 1/10,000th of an inch per inch per year—less than 1/64th inch per inch in 100 years.

This has guided the development of metals capable of operating at greatly increased temperatures and speeds—and secured *more power per pound of turbine*, a vital necessity in a destroyer!

Westinghouse Electric & Manufacturing Co.,
Pittsburgh, Pennsylvania.

Westinghouse

PLANTS IN 25 CITIES OFFICES EVERYWHERE

AUGUST, 1943

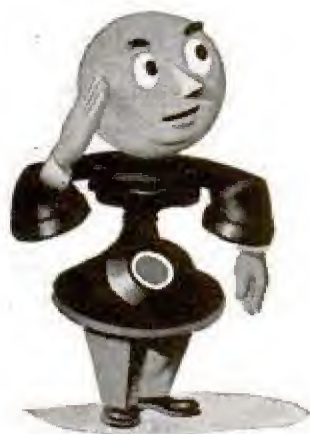
This One



BC2C-67P-P8WW

1A

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A Flag with 46,200 Stars

THE service flag of the Bell System had 46,200 stars on May 1. It has a lot more now. Telephone men and women are serving with the armed forces everywhere.

Those who are right in the middle of the fighting realize especially the importance of the telephone job back home.

"Tell the gang," their letters say, "to keep on plugging."

"We wouldn't have the stuff for fighting if the rest of the Bell System wasn't sticking to the job and pushing through the calls that get things done."

"Takes team-work to win a war — especially a big one like this."

BELL TELEPHONE SYSTEM



★ *Your continued help in making only vital calls to war-busy centers is more and more essential every day.*

Popular Mechanics Magazine

Registered in U. S. Patent Office and Canada

H. H. WINDSOR, Founder

H. H. WINDSOR, Jr., Editor and Publisher

August, 1943

Vol. 80, No. 2

Next Month

TWENTY-EIGHT ton jack of all aerial trades is the Liberator B-24, famed workhorse of the war. It has figured in bombing raids from Berlin to the Bismarck Sea. Bristling with machine guns, a bellyful of bombs, it is the nemesis of Axis fighters and the bane of Axis bases. Though it is made up of 100,000 parts, the goal of one factory is to produce Liberators on a "bomber an hour" schedule. Its combat record is revealed in "Battle Log of the Liberators" in the September issue.

Life on a Raft

DID you ever drink a fish? How would you make sea water palatable? What should be the color of a lifeboat's sail? How best can you signal a rescuing airplane crew? Scores of new safety measures for men who are forced to abandon ship have been taken by the sea services, many of them suggested by sailors who spent days or weeks adrift, and know what they needed. How American seamen get a new lease on life is told in a September feature.

Sub Secrets

HAND-PICKED crews of America's submarines aren't given to boasting. But the enemy high command knows of their exploits, all too well. From the day of the Pearl Harbor attack, Yankee pigboats have been waging a relentless war of attrition against Japan's Achilles heel, her ocean lines of supply. It's a lonely life of weeks afloat, but the submariners wouldn't trade places with anyone in the Navy. Read their story in "America's 'Silent Service'."

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Nature's Meat Market

GREAT-GRANDPA never used a ration book for his Sunday roast, and neither need you, if you take advantage of the abundance of game, fowl and fish available. A continuing harvest of game is one answer to the meat shortage, and if not taken will merely become a source of damage to crops and forage, the U. S. Fish and Wildlife Service says. Civilians can cash in on the increase in wildlife, and help keep the wartime dinner pail full. Next month read "Free Meat—Come and Get It."

They'll Wear the Stars

"RUGGED" is the way the West Point cadets describe wartime living at the "college for generals" on the historic Hudson. Panoply and parade have yielded to the demands of a sped-up curriculum, 16-hour days filled with work as theoretical as thermodynamics and as practical as bayonet practice. Besides cramming four years' study into three, the future commanders learn lessons on the current war from officers just back from the battlefields. Withal, the spirit is still that which produced the Grants and Lees, the Pershings and MacArthurs, as "West Point at War" in next month's issue describes.

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A CLEAN ENGINE LICKS HEAT



A new engine is a cool engine because it is clean inside. But as your car grows older, the engine accumulates sludge, gum, dirt, engine varnish, hard carbon and other contaminants. Here is where trouble starts, especially when hot weather comes. These contaminants insulate the metal. Your engine doesn't give off heat properly. Efficiency of the cooling system is retarded. Your car wastes gasoline. Oil thins out and burns.

A clean engine, however, licks heat. And the engine of your car can be kept clean, cool and efficient with Pyroil.

**VICTORY
SIZE
3 OUNCES**

Simply pour a pint of Pyroil in the crankcase. Add a little to the gasoline tank, too. You will soon notice the difference because Pyroil will clean out the engine thoroughly and quickly.

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Where no name and address appear directly under an item, the product is not believed by us to be commercially available

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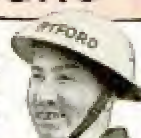
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BOMB HITS CROWDED ENGLISH HALL—GAS

PERILS RESCUERS...

A true experience of Frederick Mockford, Incident Officer, Deptford District Civil Defense, London...as cablegrammed by a war correspondent.



DISTRICT POST INFORMED ME

HIGH EXPLOSIVE BOMB HIT JUST BEFORE

CLOSING TIME. BOMB WENT THROUGH

BILLIARD ROOM, CARRYING TABLES

CLEAR DOWN TO CELLAR.



I GOT MY SQUAD ON SPOT WITHIN FEW

MINUTES. ESCAPING COAL GAS OVERCAME

SEVERAL RESCUERS AND MADE FLASHLIGHT

SAFEST AVAILABLE LIGHT. RESCUE PARTY

WORKED THROUGH NIGHT UNTIL DAYLIGHT, BOMBS

CONTINUING TO ROCK BUILDING



I SENT SOS CALL FOR BATTERIES.

THANKS TO FACT FRESH ONES WERE

AVAILABLE FOR JUST SUCH EMERGENCY WE

WERE INSTRUMENTAL SAVING LIVES

AT LEAST 15 PEOPLE.



Keep your batteries ready for emergencies!

Mr. Mockford's experience—like many such others that have come out of England—is typical of the many emergencies that call for the use of a flashlight. Any kind of open flame would have ignited the coal gas, blocking attempts at rescue.

For your own protection, as well as to conserve materials vitally needed elsewhere in this war, follow the suggestions and instructions of your local Defense Council. Reduce the use of your flashlight to a minimum. Make the batteries last longer!

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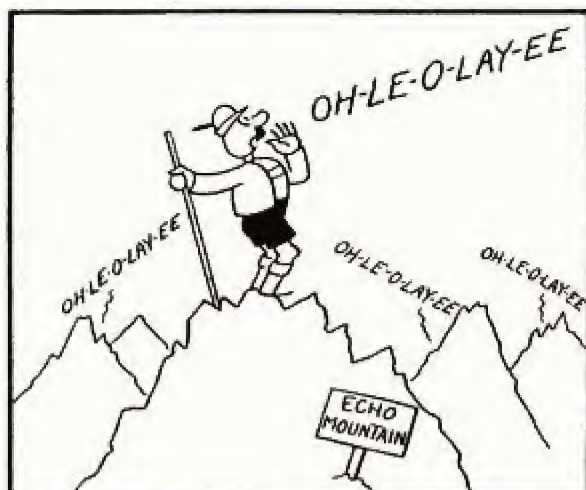
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FRESH BATTERIES LAST LONGER...
Look for the **DATE-LINE**





O. SUGLOW



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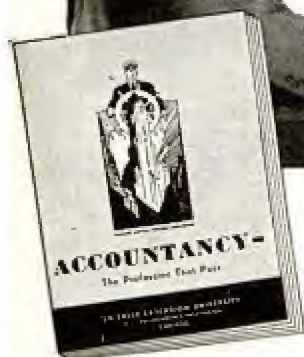
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IMPORTANT NOTICE

It is the intention of this magazine to provide its readers with information regarding the latest developments in the mechanical arts. We take no responsibility as to whether the disclosures contained in our articles are covered by patents and advise readers to investigate this subject before making, using, or selling any of the products, machines, or processes described in order to avoid possible liability for patent infringement.

WARTIME OPPORTUNITIES for You in ACCOUNTING



supply is diminishing. That spells opportunity for many—perhaps for you.

The reason is simple.

Government needs more accountants. Many new activities are enlarging old bureaus and creating new ones—military, supplies, taxes, priorities, social security, price regulation, more indeed than we can name here.

Industry needs more accountants. New plants, enlarged plants, conversion to war production, more government regulations and reports, taxes, priorities, etc.—all call for more and better records.

This need will persist and increase all during the war—it will open many, many fine jobs, fine both in responsibility and pay. Nor will it end sharply with peace—it will continue through the difficult post-war adjustment period.

Yet many present accountants are going into the armed services. Their places and the calls for more accountants can only be filled by new men and women coming into accounting and coming quickly.

Can You Grasp This Opportunity?

That depends largely on you.

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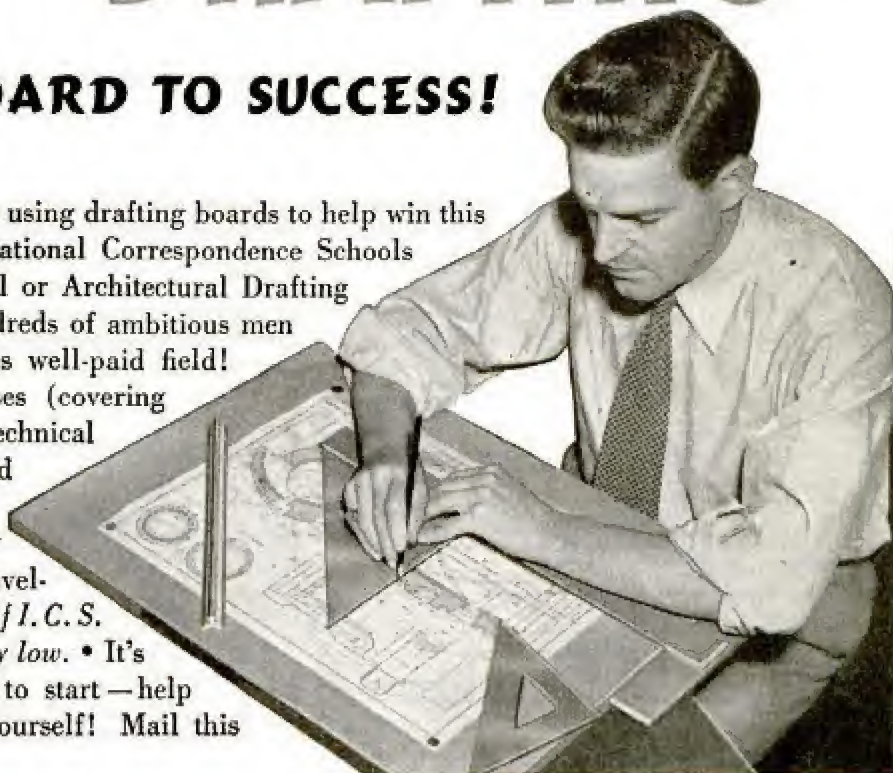


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- ☐ Electrical Engineering
- ☐ Electrician
- ☐ Electrical Maintenance
- ☐ Foundryman ☐ Heating
- ☐ Heat Treatment of Metals
- ☐ Highway Engineering
- ☐ House Planning

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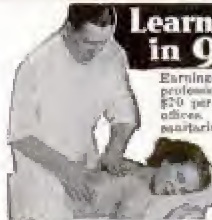
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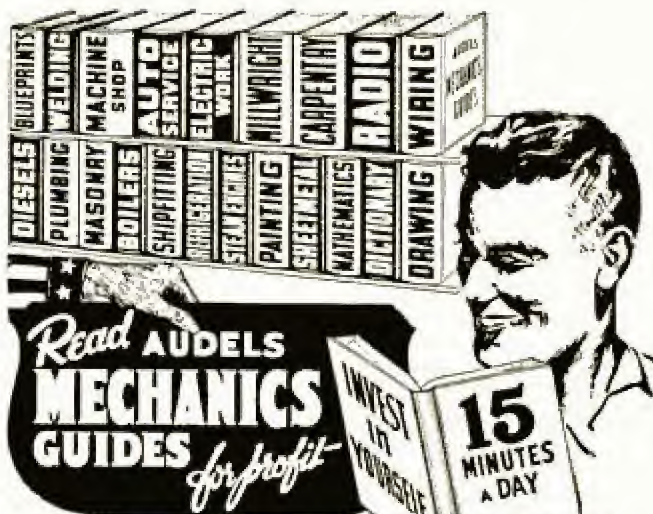
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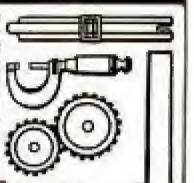
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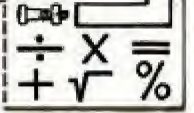
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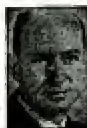
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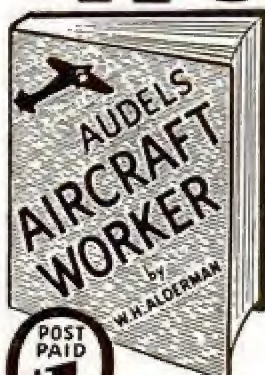
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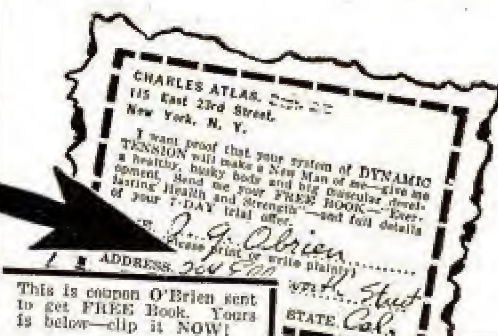
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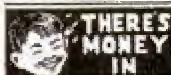


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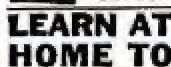
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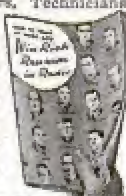
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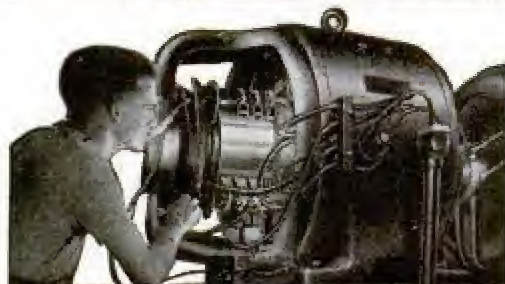
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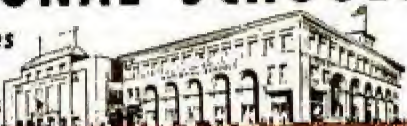
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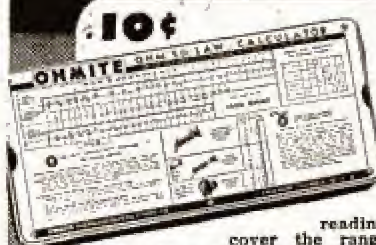
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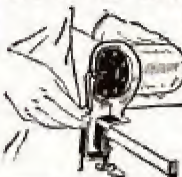


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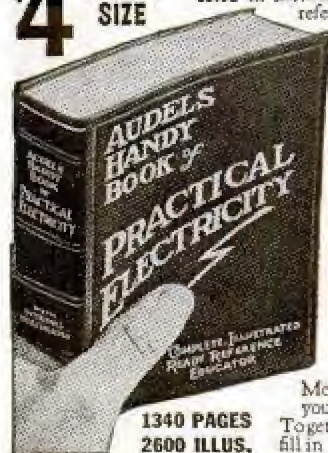
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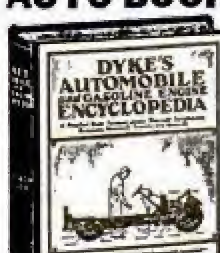
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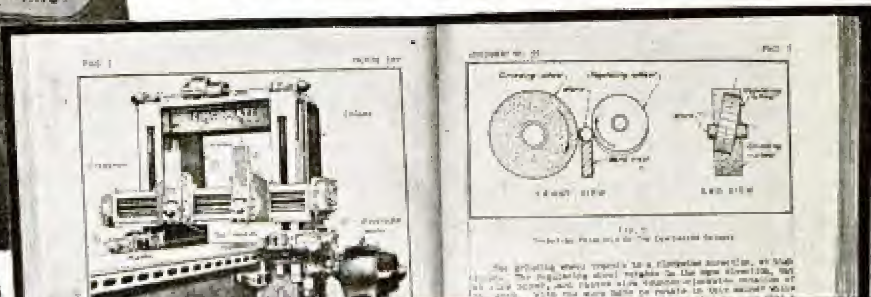
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CHICAGO Mail address. Your business, personal mail received, re forwarded daily, 3 months \$3. General, 30 West Washington, (Established 1919.)

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KNOB Handle, cushioned, 2 lines 30c. 3—40c. Stamp Works, Centerport, N. Y.

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PAINTERS All-around pot hanger. Hooks on side of pot. Never misplaced. Paint pot always stays in upright position at any angle. Can be used right, left or center of ladder. United States and Canada patent. Charles T. Miller, 469 South Paramus Road, Paramus, N. J.

SORTINO Device, patent No. 2251408. Eliminates double handling of mail. This device will be sold to highest bidder. Send your cash and royalty bid immediately. T. M. Johnson, Wadsworth, Ohio.

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IT FIRES BY
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IF I WEREN'T
LOOKING AT
IT, I WOULDN'T
BELIEVE YOU

I BET IT'S A
LOT COOLER
TOO, DAD, THAN
ORDINARY
GUNS



THE YOUNG LADY IS
RIGHT—COOLNESS DOES
A LOT IN THIS DEVICE

IN THIS
ONE, TOO. I
NOTICE YOU
APPRECIATE
HOW COOL,
MELLOW, AND MILD
PRINCE ALBERT
SMOKES



IT'S
THAT NO-BITE
PROCESS AND
THE CRIMP CUT.
PRINCE ALBERT IS
SO MUCH **EASIER**
ON MY TONGUE, YET
THE **RICH TASTE**
IS THERE!

YOU'RE
TELLING ME?
AND A RA. 'MAKIN'S
SMOKE NOT ONLY
TASTES RIGHT—
IT ROLLS RIGHT— FAST
AND SMOOTH WITH
GOOD CLEAN ENDS



**BUY WAR
BONDS AND
STAMPS**

50

PIPEFULS OF FRAGRANT
TOBACCO IN EVERY HANDY
POCKET PACKAGE OF
PRINCE ALBERT

70

FINE ROLL-YOUR-OWN
CIGARETTES IN EVERY
HANDY POCKET PACKAGE
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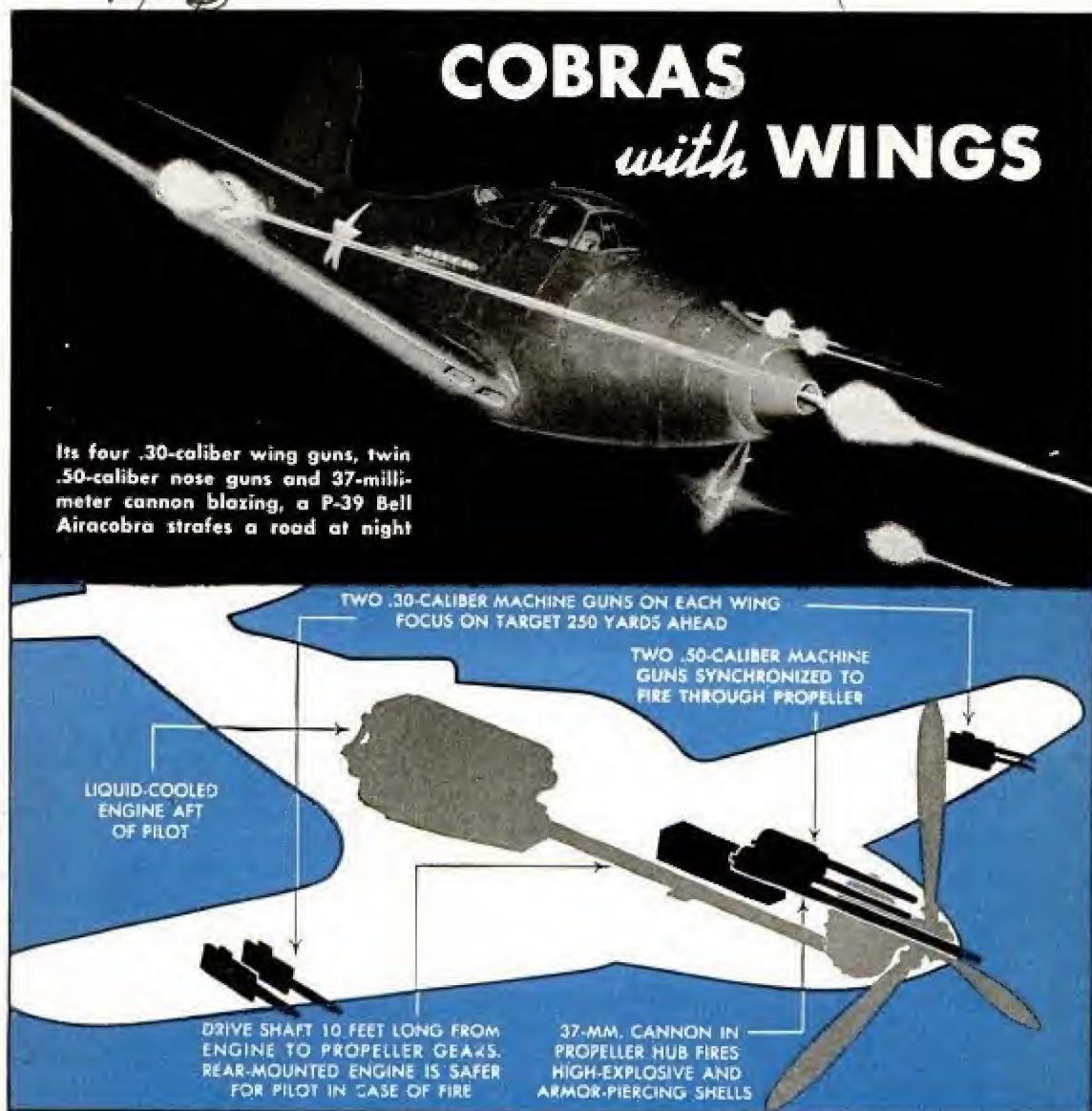
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WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 80

AUGUST, 1943

No. 2



FLEECY clouds hung over the dusty Tunisian hills. From between them a squadron of American aces flying swift P-39 Airacobras spotted billows of dust stirred up by the long line of Nazi tanks and guns rolling westward toward Faid pass.

Lt. Col. Richard B. Klocko, the squadron leader, dipped his wings as a signal and peeled off. One by one the Airacobra pilots followed him down and in a few seconds, they were roaring over the panzer column.

50 feet above the blistering earth and the blazing guns of the Afrika Korps. Nazi drivers dived for cover from the withering blasts of the 'Cobras' 37 millimeter nose guns and tanks and supply trucks were stopped in their tracks. Each pilot would swoop in low, sometimes only thirty feet above the ground, then climb away to reform in line and dive in to strafe the enemy again and again.

In daylong raids Colonel Klocko and his

AUGUST, 1943

1943
Lunkirk
N. Y.

Bed Aircraft Co.
2050 Chumwood Ave.¹
Buffalo, N. Y.



U. S. Army Air Force photo
Earth thrown up into a revetment guards Airacobra from bomb fragments

fighters poured cannonfire into the armored column, providing the ground forces with formidable aid in slowing down the westward march of the Germans in the battle of Sidi Bouzid.

They dished it out, and they took it. Many of the P-39's came home peppered with holes from machine guns and cannon. Two had ailerons shot off. The left wing tank had been blasted from one. But they all came home safely.

On another foray the 28-year-old Klocko—whose home is at Dunkirk, N. Y., not far from the birthplace of the Air-

At right is the potent 37-millimeter cannon in propeller hub



acobras in the Buffalo plant of Bell Aircraft—undertook with another pilot the hazardous mission of dropping orders to a beleaguered infantry battalion, which enabled the Yanks to outmaneuver the oncoming Nazis. For this Colonel Klocko was awarded the Silver Star.

The 'Cobras and their Yankee pilots hit hard in North Africa, and they are hitting hard over Kiska and the Solomons and in Russia. Reports from the Russian front say they are superior to German aircraft in fire power, performance, and ability to take punishment. Pilots of the Red air force

fondly nicknamed them Cobrastochkas—"dear little Cobras"—and were particularly enthusiastic about the 37 millimeter cannon in the nose.

The P-39 is the fighter that was built around the cannon. Its primary function was to strafe the enemy on the ground.

They put its formidable cannon, firing a shell with half the diameter of the M-4 tank's 75, at the centerline of the fuselage, its gun barrel projecting through the propeller hub. Above it are two 50-caliber machine guns synchronized to fire through the propeller arc, and on each wing are two 30-caliber machine guns,



"toed in" to focus their fire on a target point about 250 yards distant. It is heavily armored at all vital points, for which many a pilot still living is grateful.

The liquid-cooled engine is mounted behind the pilot, providing excellent visibility, and the Airacobra was one of the first to adopt the tricycle landing gear for safe level landings at the characteristic high speed of the pursuit craft.

Twice-decorated Maj. Walter B. Putnam of Tulsa, Okla., led a squadron of Cobras in a Jap-smashing raid over Buna, New Guinea last year and won the Silver Star for his daring achievements. Despite a terrific rain and poor visibility he succeeded in demolishing the Jap district officer's house, wrecked eight to ten planes on the ground, silenced a gun and set afire a gasoline dump.

Months earlier, in the Philippines, Major Putnam won the Distinguished Service Cross in a single-handed battle with a Jap convoy which ranks among the greatest aerial feats of the war. Cruising alone, he sighted Japs landing from a convoy. Going in with his guns wide open he blasted a motor barge to the bottom, then turned



Hidden in palms near a tropical air field, a P-39 is groomed for battle

toward a big transport unloading troops. With one blast he hit its powder magazine. Strafing four more transports, he saw two planes being catapulted from a cruiser. He sent them both blazing into the sea. Before going home, he dove at another transport and watched it blow up as he pulled away.

Three more wearers of the coveted Silver Star are Capt. Thomas J. Lynch of Catasauqua, Pa., Lt. Frank Adkins, Clarksville, Tenn., and Lt. Eugene A. Wahl, Indianapolis, Ind. Flying three Airacobras in a squadron of seven fighters assigned to guard a convoy of Allied troop ships in the south Pacific, they suddenly sighted a

Drawing shows how Lt. Col. Klocke's squadron strafed Nazis in Tunisia

Courtesy Bell Aircraft Co.





"Cobras with Wings"—and with seven deadly stings—swarm on an American air field

flight of 16 Jap Zeros 3,000 feet overhead. Outnumbered better than two to one, the Cobras climbed up to give battle and protect the troop ships. The skirmish was short, but too long for the Japs. Lynch, Adkins and Wahl each won the right to paint another rising sun on his ship, and the surviving 13 Zeros hightailed for home. The citations the Yankee trio received read: "Their courage and fearlessness in attacking a superior enemy force when their own formation was at a disadvantage, both in altitude and position, are qualities to be admired in any airman and are

worthy of the finest traditions of the United States Army Air Force."

Airacobras helped the Marines land on Guadalcanal. They are guarding the Aleutians and Alaska and the Panama Canal. They have knocked down as many as 39 German planes with only one loss. Representatives of Russia's Red air force are pleading for more "Cobrastochkas" for their fighter pilots.

The fearless youngsters of the "Fightin' 42nd" Fighter Squadron have been riding a pack of Cobras planting venom all over the face of Kiska island.

Pilots exhibit the cannon and six machine guns of a P-39



One day at dawn Major Wilbur Miller led the P-39's through the haze to that Jap-infested rock in the western Aleutians. As the target loomed ahead the pilots fanned out to do their prearranged jobs. Two Cobras caught a boatload of Japs scurrying for shore and riddled them with gunfire. Two others set afire a four-motored flying boat as it tried to get into the air. One Yankee lieutenant rode herd above scampering Japs and machines along a Kiska road. Major Miller himself led an attack on the anti-aircraft batteries concentrated along the ridge protecting the harbor. Meanwhile the

heavy bombers overhead were unloading. Just then a radio spoke: "Jap on the tail of a P-39 over the harbor."

Major Miller gave the command: "Everyone out of here. The raid is over." The leader himself turned back to help out the pilot in trouble. Capt. Ken George followed him in, but neither noticed the Jap Zero sneaking down on them from the clouds. The Zero ripped into Miller's plane. Captain George went after it, but his guns jammed, and before he could get them in action again the Jap had escaped. Major Miller, his engine dead, radioed that he would have to land on the water. They saw him hit. Miller came up, waved that he was all right. They could give him no help. The squadron returned to base, reloaded and went back to Kiska immediately. On this trip they knocked down five Zeros, but there was no sign of Major Miller. Whether he went down in the icy bay or is a Jap prisoner is still unknown. To the boys of his squadron, the loss of Major Miller will never be repaid. But they're blasting away regularly to collect installations from the Japs.

On one subsequent raid one Cobra pilot sent down in flames a Zero that was attacking a P-38 Lightning, while two other P-39's teamed up to demolish a Nipponese float plane. Four more Cobra fighters blasted another group of float planes on the water. Another pair flung 37 millimeter shells into a warehouse and watched a fuel dump and an ammunition dump explode.

Just to be sure of the float planes, a Yankee captain made another run and flew into a terrific concentration of antiaircraft bursts. When he reached the home base there were holes in both wings, the tail and propeller. The Cobras can take it!

Frozen Food to Replace Fresh In Postwar Groceries

Instead of bins of tomatoes, spinach and other "fresh" vegetables, the postwar grocery store will have low-temperature, self-service cabinets, and will feature frosted vegetables, many already cooked. Housewives even in remote villages will be able to buy delicacies from all over the world, in the view of Clarence Birdseye, pioneer developer of frozen foods. When the housewife takes her purchases home, she will put them in the frosted food compartment that will be a feature of every postwar refrigerator. Instead of the 65 quick-frozen foods now available, there may be hundreds. Huge mechanized farms and processing plants will produce "unbelievable tonnages at very low costs," Mr. Birdseye predicted, with great savings in metal for containers and the weight of shipments.

AUGUST, 1943

Gloucester, Mass

Rubber-Clad 'Man of Mars' Mops Up Gassed Area



In gas mask, rubber gloves and rubberized clothing, soldier is equipped to decontaminate a gassed area

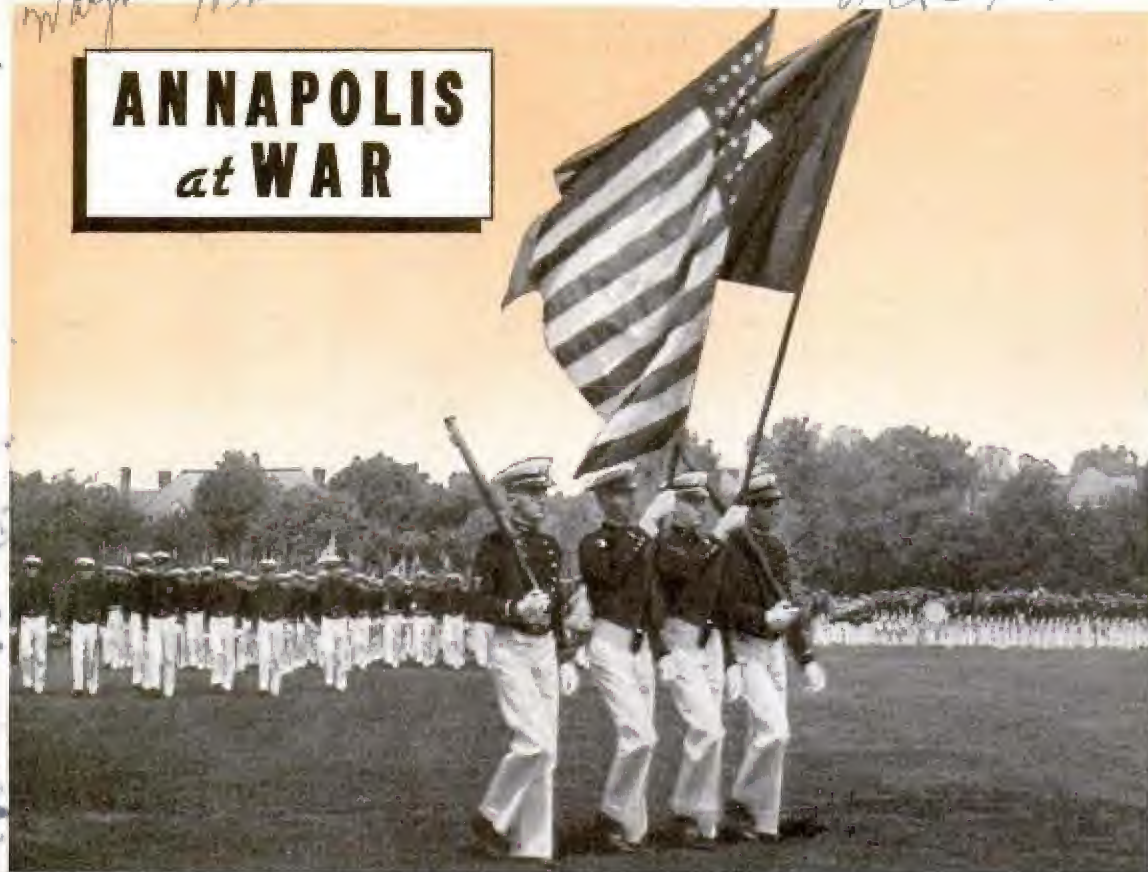
Weird in appearance but eminently practical is the "Man from Mars" costume worn by a member of the decontamination squad at an Army bomber base in Texas. His clothing consists of a coverall of rubberized material, rubber gloves, and gas mask, and he carries an apparatus for neutralizing gas in an area attacked.

Lemon Pectin to Treat Shock Substitutes for Plasma

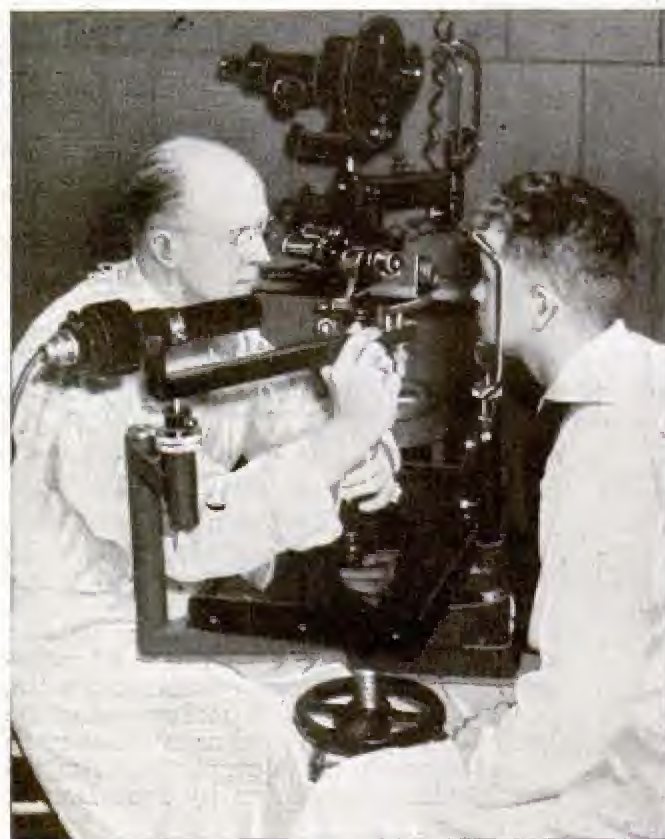
Lemon pectin has been reported successfully used in place of blood plasma to treat patients suffering from shock. Solutions for treatment of shock must contain colloidal constituents that will remain in circulation for extended periods and maintain blood volume and pressure. Pectin, prepared from the white peel portion of the lemon, has been reported as satisfactory in these regards in the Journal of the American Medical Association by four Detroit physicians.

Wayne Whittaker 71239

ANNAPOLIS at WAR



Tomorrow's admirals—3,000 strong—follow the color guard at U. S. Naval Academy. Below, midshipman gets his eyes tested



By Wayne Whittaker

THE crew of alert midshipmen are at their stations.

"Enemy cruiser sighted to port," shouts the lookout.

"Stand by to fire torpedoes port side," orders the captain.

Estimated enemy course and speed are cranked into the torpedo director as the torpedo tubes swing out and ready lights flash on.

"Fire one! Fire two! Fire three! Fire four!"

Action between the heavy forces becomes imminent. The spotter in the foretop has transmitted over his telephone estimates of enemy range, course and speed. Quickly the men in the plotting room convert these into gun elevation and train as the gun director picks up the target. Pointers are matched and ready lights signal the guns loaded and ready to fire.

"Salvo!"

"No change," cries the spotter, noting that the salvo has straddled the target and needs no correction.

"Rapid fire," orders Control, and salvos follow as fast as guns can be loaded.

Conducting pendulum test for gauging force of projectile

This is no task force in the Pacific, but a drill period in Dahlgren Hall of the United States Naval Academy at Annapolis, Md. The only difference in performance is that the midshipmen do not actually fire torpedoes and guns. They are, however, trained in all the intricacies of torpedoes and of antiaircraft and main battery fire control. They cruise down Chesapeake Bay to gain sea room for actually firing the larger caliber guns.

"Battle conditions are simulated whenever possible," says Comdr. Henry F. Agnew, executive officer of the department of ordnance and gunnery. "When midshipmen are graduated as junior officers during the war and are assigned to the fleet, there is often no time for a period of orientation aboard ship. They know their first shot at sea may be for keeps. They learn to function as a team."

The practical training in gunnery is typical of wartime Annapolis. In every department, ord-



U. S. Navy photos

One of the "textbooks" at the academy is the yacht above on which midshipmen practice seamanship on cruises down Chesapeake Bay. Below, group of first classmen gather about 5-inch gun for firing instruction which simulates the real thing with teamwork between crew and plotting room





Midshipmen in pistol drill on one of outdoor ranges

nance, navigation, seamanship, tactics, engineering, the streamlined program is based on the practical needs of a greatly expanded navy fighting on the seven seas.

Thousands of new naval officers are

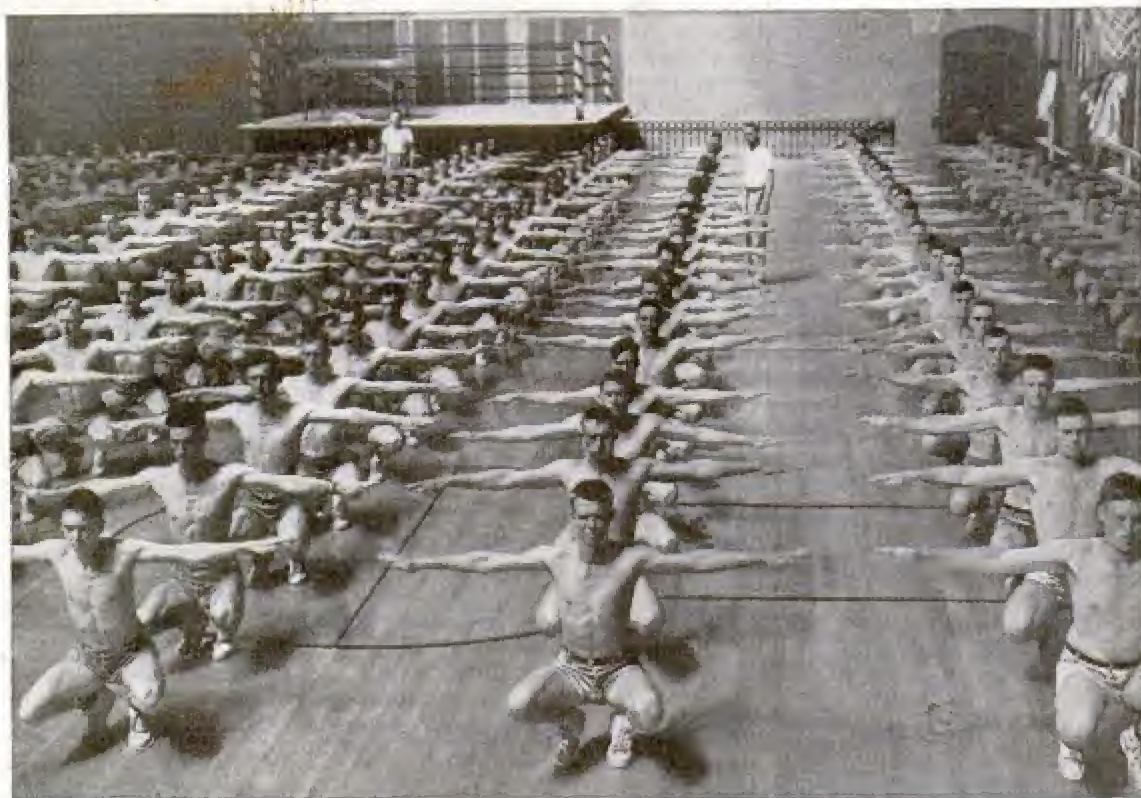
needed. The business of training them in the shortest possible time is the biggest job the academy has shouldered in its 98-year history. The first great hurdle was telescoping the regular four-year course to three years. This was accomplished by accelerating rather than reducing the scope of training with the result that the present course includes about 96 percent of the academic and theoretical study previously covered with no appreciable loss in professional naval subjects.

Among the courses expanded are those dealing with naval aviation. A training squadron at the academy familiarizes midshipmen with the latest equipment. Ground school includes fundamentals of engine maintenance, navigation and gunnery, theory of flight and air tactics, but there is no pilot training.

With the great variety of vital subjects to be mastered in the condensed course, there is no opportunity for the extensive time required for pilot training, according to academy officials. The navy prefers that academy graduates undertake pilot training after a period in the fleet. Secretary of the Navy Knox recently announced that all new graduates will be ordered to naval air stations for a 10-week aviation course prior to joining the fleet.

Foreign language study has been expanded, and midshipmen are now offered Japanese, Russian, Italian, Spanish, French,

Mass calisthenics in academy gymnasium helps build muscles that have filled cases with silver trophies



German and Portuguese.

Despite the need for officers, the midshipman who fails to measure up is flunked out—or “bilged”—as quickly today as in peacetime. Directors of the academy, under the superintendent, Rear Admiral J. R. Beardall, are not conducting an assembly line just to produce ensigns. They are training the admirals of tomorrow. The midshipman's rank was handed down from early days when junior officers were stationed amidships in battle.



Above, midshipmen racing through the obstacle course that circles Faragut Field. The course is a wartime innovation



Left, boatloads of midshipmen on way to board destroyer for a prewar cruise. Trips on warships are out for the duration

Below, building a model ship in the hobby shop maintained for the men at the academy. Elaborate models are prized

Months before the United States entered the war, the Navy recognized the need for expansion. Two new wings added to Bancroft Hall made it the largest dormitory in the world. It surpasses the National Capitol in size and houses 3,000 midshipmen and 300 reserves. A large field for combat tactics, soldiering, maneuvers, landing operations, assault and scouting, was developed across the Severn River. The academy grounds cover more than 10,000 acres.

During the transition from the four- to three-year course in 1941, the





Surf landing drill is so tough it's often used as disciplinary measure

academy broke all precedents by graduating three classes of midshipmen, sending 1,500 junior officers to the fleet. This year's June class numbered 770 regular midshipmen and 300 reserves.

The reserves, trained in groups of 300, are graduates of civilian colleges and receive a four-month course of indoctrination, marine and electrical engineering to qualify for engineering duty afloat. The academy also trains graduates of technical schools to serve as ordnance inspectors in munition plants. Many reserve officers have been trained to be physical directors in pre-flight schools.

War has eliminated the summer practice cruises. This creates a hardship but solves a problem. Although the midshipmen are denied valuable seagoing training, their summer is spent on academic work that would otherwise be lost in the three-year

course. Second- and third-year men take cruises on smaller vessels in Chesapeake Bay.

Many instructors have been called to the fleet. Some 350 reserve officers and civilians were summoned to help bear the teaching load. Key positions, however, are held by regular navy officers, many with international reputations in their fields. For example, Comdr. A. A. Ageton, who developed the Ageton system of navigation, helped condense the academy's course in navigation.

Among the 1,100 officer-instructors and post-graduate students are men who have taken part in every major naval action of this war. Comdr. Agnew was navigator of a cruiser that received a direct bomb hit in the attack on the Marshall Islands. His ship also saw action in the Coral Sea and helped rescue the survivors from the Lexington. Two gunnery instructors, Comdr. B. L. Rutt and Lt. Comdr. S. G. Moore, were at Pearl Harbor and took part in the Pacific campaign that followed. Officers of similar experience in the various departments bring the midshipmen practical lessons from the firing line.

The midshipman's day begins with reveille in Bancroft Hall at 6:15. The classes are divided into small sections of about 16 men who march in a body to and from recitations. During the day, each hour of recitation is followed by an hour of study.

To follow him through a typical day at the academy, you would join him at breakfast at 6:45. At 7:20 his room is ready for inspection from the proper tuck at the foot of his carefully made bed to the arrangement of books on his study table. At 7:45 he joins his class group before marching to Luce Hall for a lesson in seamanship, called "seamo" by the undergraduates. Before an examination, he may pause at the statue of Tecumseh and toss a penny toward this replica of a figure-head on the old ship Dela-



Maneuvering toy fleet on floor with "compass" showing course

Sextant drill — every midshipman becomes expert navigator

ware—a traditional lucky gesture.

Perhaps his class in seamanship today will be on the "game board." The floor, or board, is marked off in one-foot squares, each representing 1,000 square yards of ocean. Each midshipman is in command of a toy ship which he moves with the "fleet" in accordance with directions relayed by signal flags at one end of the room. This lesson combines tactics and signals. Or, he may study how to anchor a ship with the scale model provided, or the fueling of a destroyer from a battleship.

"Every textbook used in the seamanship course this year is either new or completely revised," says Comdr. W. P. McCarty, director of the division.

Leaving seamanship class, the midshipman walks down a hall whose walls—"bulkheads" to him—bear the words of naval heroes: "We have met the enemy and they are ours"; "Don't give up the

(Continued to page 158)

Right, scaling "commando" barrier. Below, on board a "Yippy" or yard patrol vessel



7-344

Two-Way Nazi Tank Buster Has Dual Controls

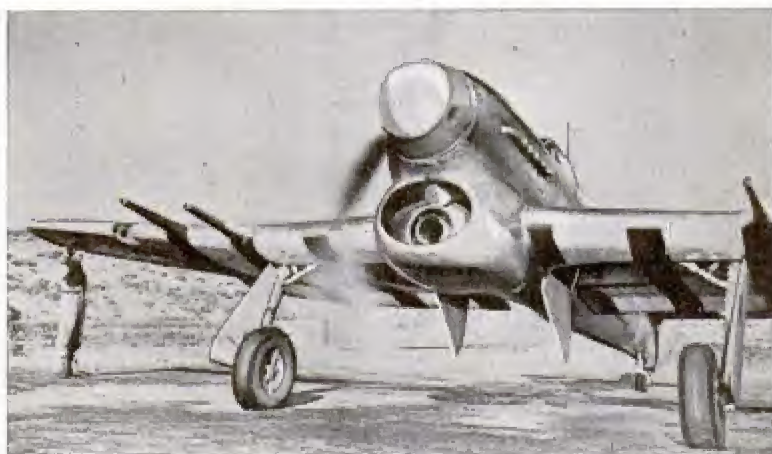


Captured by American forces in battle with the 10th Panzer Division in Tunisia was a multi-wheeled German tank destroyer, equipped with a 75-millimeter gun and dual controls. Driven from both front and rear, it is able to operate either forward or backward. Under its "new management," the Nazi vehicle was repainted and put back into action against its former owners.

Nazi tank destroyer driven from either end is captured by Yanks

Fastest Single-Engined Plane Also Is Most Heavily Armed

Described as capable of blasting from the air any enemy plane that might oppose it, the Royal Air Force's newest fighter, the Hawker Typhoon, has been called the fastest and most heavily armed single-engined plane now in operation. It is a single-seater, low-wing monoplane of metal construction, armed with either four cannon or 12 machine guns. The new fighter has rapidly set a record for effective attacks against railway and other transport targets, and one squadron



British Typhoon has Napier-Sabre engine, four cannon or 12 machine guns

three months of operations. The Typhoon is powered with the Napier-Sabre engine. blasted 100 enemy locomotives in just over

Army's Two-Man "Bazooka" Rocket Gun Can Destroy Enemy Tank

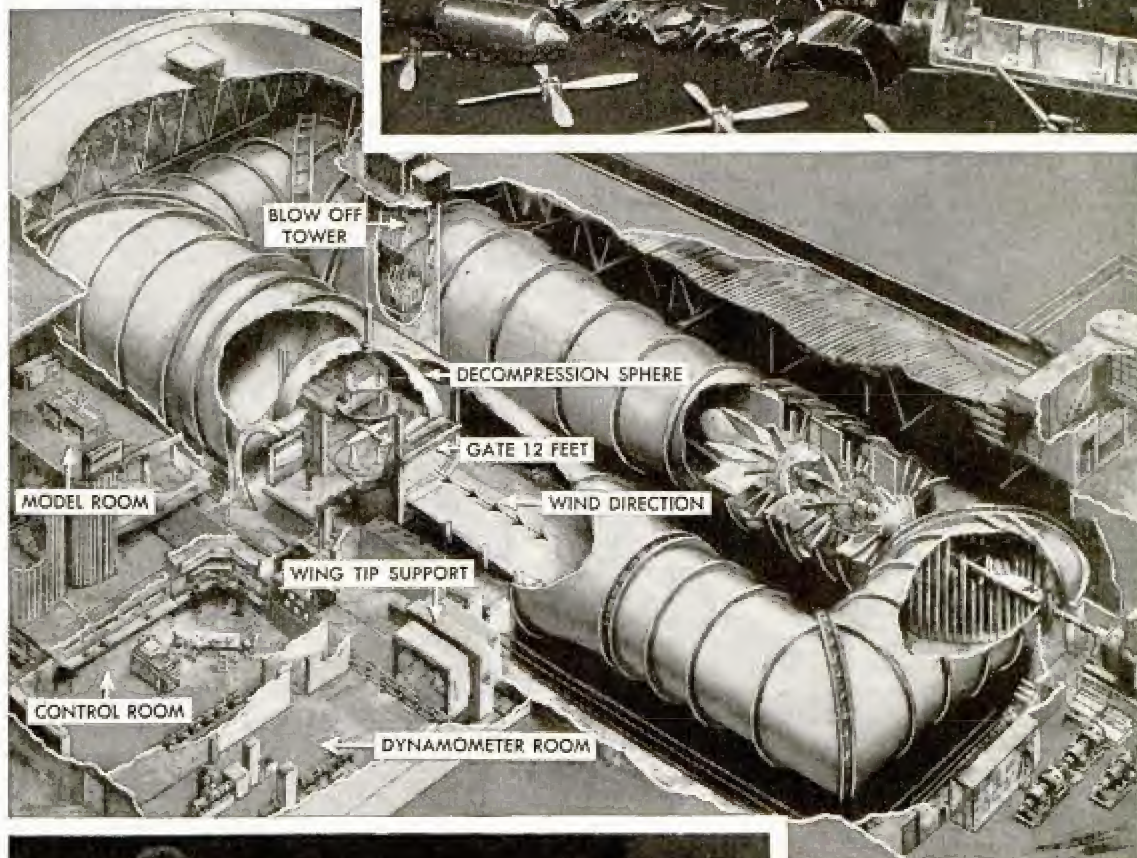
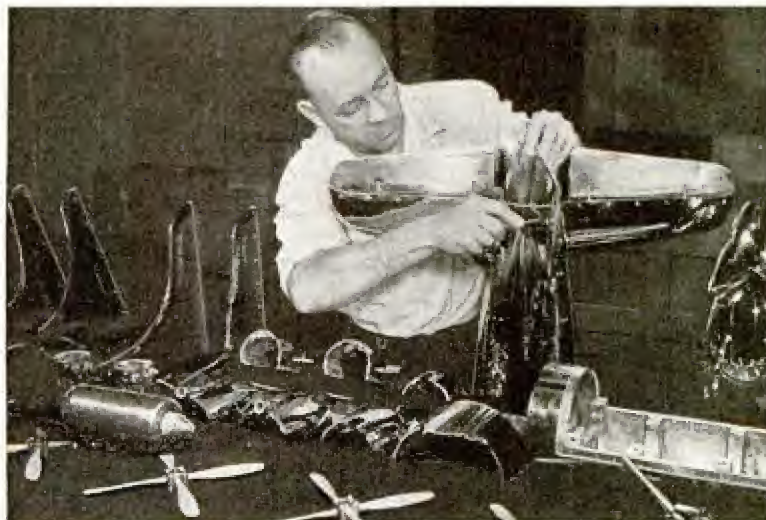


"Bazooka" destroys enemy tanks with projectiles propelled like rockets

Using the rocket method of propulsion, the army's newest antitank gun, dubbed by soldiers the "Bazooka," is operated by only two men. One soldier loads and aims it, and the other, who fires it, carries it on his shoulder. Army officials declare it capable of destroying any enemy tank. One Nazi tank commander, fired upon by the "Bazooka," promptly surrendered, believing he was under fire by large-caliber guns.

Wind Tunnel Develops 700-Mile-an-Hour Gale

This proving ground for planes is the \$2,100,000 wind tunnel built by California Institute of Technology. Here models costing as much as \$25,000, small-scale duplicates of operating airplanes, are tested in wind speeds up to 700 miles an hour, blown up by a double set of great propellers. At right, wing sections, nacelles, tail groups and shapes used in arriving at final design of the plane in wind tunnel. Below, cutaway drawing of tunnel



Within the tunnel, pressure may be increased by several atmospheres, the effect being to increase the size of the model being tested, to provide more accurate data on full-sized craft. The model airplanes are assembled on carts in the model room and wheeled to the test chamber in the throat of tunnel. A decompression sphere encloses the test chamber, providing for engineers to enter to make alterations on the model without affecting the air pressure inside the tunnel itself. Left, trying a model wing to its final shape

KEEPING 'EM ROLLING



From cowcatcher to cab, the big steam locomotive (above) of the Santa Fe Railway gets a general washing and cleaning upon arrival at the Chicago roundhouse. On a special wash rack, road dirt and grease are removed with mixture of steam and cleaning solvent released from high pressure jet. Locomotives must be kept in tiptop shape these days to help carry the greatest tonnage of war goods in history—thousands of tons of tanks, guns, food, bombs



† Lubricator filling grease cavities of locomotive running gear. The job of filling the cups takes 20 minutes and is performed on all locomotives before each trip. Grease is packed in under pressure of 130 pounds per square inch



Not a speck of dirt will remain when workmen (left) finish cleaning air conditioning unit on one of the stainless steel cars. This will insure clean, pure air for the interior of the cars, adding to the comfort of the traveling public

*80 C. Jackson Blvd
Chicago, Illinois*

3/1/61

Right, testing locomotive's air brake equipment and train control apparatus. Mechanic has his hands on valves which control air brake

Below, foreman signals hostler to move 4,000 horsepower Diesel-electric locomotive over pit for a close inspection of wheels, trucks



Below, streamlined Diesel locomotive gets a face washing with steam and cleaning oil. After every trip the locomotives are thoroughly cleaned, carefully inspected



Some of the 50 tons of sand consumed monthly at single roundhouse is poured into a locomotive's sand dome (below). Sand gives traction to driving wheels, also is used to clean flues



*Hostler
Bial.*

34. Colville

71-324

Skip-Bombing of Axis Ships Recalls a Childhood Game



Momentum of bomb dropped from low altitude carries it into side of ship

Familiar to any child who has skipped a pebble across a pond is the principle behind the Allied technique of masthead or skip-bombing, the type of attack which, co-ordinated with bombing from high level, so as to make the enemy divide his anti-aircraft fire, sank an entire Japanese convoy in the Bismarck Sea. Speedy bombers with plenty of firepower forward, in the wings and nose, are used for the low-level attack, coming in barely above the water to give their bombs the best chance to hit the enemy vessel broadside. Guns of the enemy fleet, already trained on the Allied attackers at high altitude, cannot be deflected in time to meet the new assault from masthead height. The bomb dropped by a speeding plane does not descend vertically at first, but rather forward and downward. Bombs dropped from a very low level thus hit at an angle, and will ricochet or "skip," as a thrown stone skips across a pool. Though bombardiers do not wish to "skip" the bomb, but rather to make its angle of fall hit the vessel broadside, or in the water hard by, this tendency of the bomb to "skip" does allow them a margin of error if the bomb is released too

soon, because the momentum of its skip may still carry it against the side of the ship attacked. Bombs are fitted with delayed-action fuses, so that the attacking plane will not be caught in the explosion. Besides introducing the element of surprise into the aerial attack, the technique permits great accuracy.

71327

Photocopy Machine Duplicates Print Or Pictures

Exact copies of any material printed, typed, written, drawn or photographed can be made quickly by inexperienced personnel with a "Photocopy Machine" whose makers assert it can save the time of typists, bookkeepers and draftsmen. The machine, which requires no darkroom and can be set up on any desk or table, makes same-size copies of anything up to 18 by 22 inches. Copies, being photo-exact, require no proofreading.



Photo-exact copies are made without use of darkroom

POPULAR MECHANICS
Garrison Photocopying & Engraving
2824 N. Clark, Chicago

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Washington Post

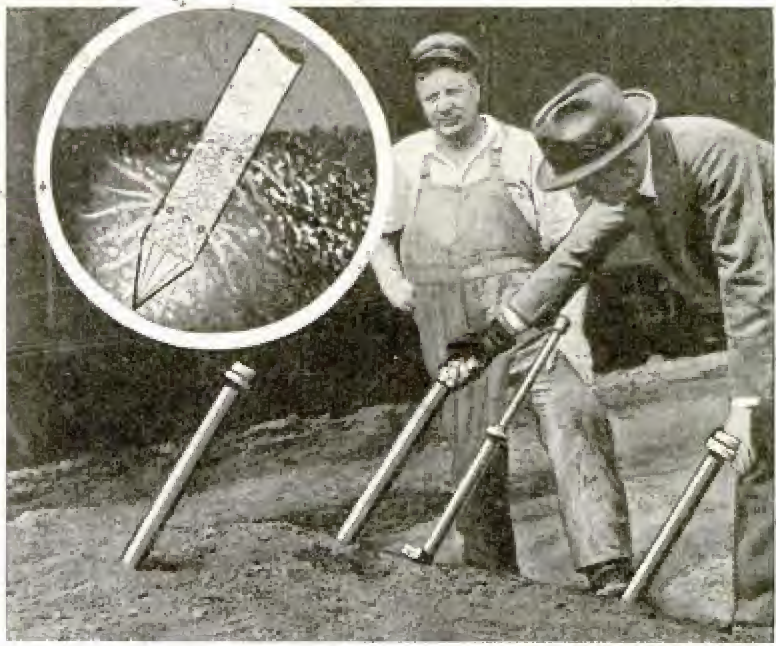
Coal Specialties Co.
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N.Y.C.

Liquid Carbonic Corp.
3100 S. Kedzie
Chicago, Ill.

7/16/33

Hot-Spot Indicator and Dry Ice Halt Coal Fires

With 80 million tons of soft coal stored by industry to guard against transportation delays, danger from spontaneous combustion has vastly increased, because such coal, especially when freshly mined, will "heat" by absorbing oxygen. When the temperature of a coal pile reaches 150 degrees, authorities say, it does not recede but "heats" further to the combustion point. To detect this critical, 150-degree temperature, hot-spot indicators with fuses that blow when any spot within 10 feet of the fuse reaches 150 degrees are plunged into the coal pile. Long, pointed tubes that contain the fuses are fitted with a cap held by tension. When the fuse blows, the cap springs up, providing a danger signal visible from several hundred feet. Instead of pouring tons of water into the coal pile at the danger spot thus designated, or shoveling or bulldozing away the covering coal, Dry Ice is used to extinguish combustion.



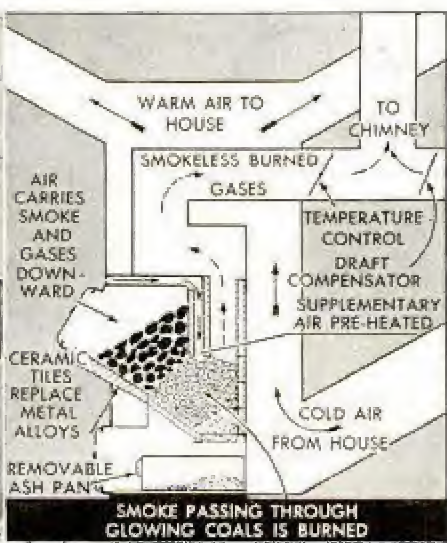
When heat from burning coal blows indicator's fuse, its signal cap springs up. Fumes from Dry Ice in perforated pipes (inset) extinguish flames

Two-inch pipes, perforated with a number of $\frac{3}{8}$ -inch holes at the bottom, are sunk into the pile around the danger spot and filled with Dry Ice. Carbon dioxide gas released in its evaporation seeps through holes in the pipe and through the coal pile to smother the flame and cool the hot spot.

Smokeless 'Furnace of Future' May Save Half of Fuel Bill

By utilizing a down-draft principle, a home "furnace of the future" designed at the University of Illinois is said to eliminate all smoke, and to utilize the heat value of smoke and gases to such an extent that savings of one half in the amount of fuel

consumed are conceivable. The down-draft burner, principle of the new furnace, could be installed in furnaces now in use. It is a slanted container, with fresh fuel at the top and the fire chamber at the bottom. As heat of the fire releases smoke and gases



from the fresh coal, these must pass through the fire to escape. Combustion is aided by a supplementary flow of air from the front of the furnace. An automatic damper to compensate for wind changes and automatic temperature control are additional features. Its basic "chassis" can be used in a gravity warm-air furnace, a forced-circulation hot-air furnace, or a space heater. In tests, ceramic products have replaced critical alloys in its construction.

Even smoke is burned in down-draft furnace, (diagram right)

J. C. Fellows
J. C. Mills } Engineers

Warren Elliott
Cpl. L. Roberts
Grubbs, Dyer

51125

TANK BUSTERS

Cpl. M. [illegible]
Lt. W. Hutchinson
Enterprise, Ala



To "Seek, Strike, Destroy," the tank-busters may use M-7, which mounts 105-mm. howitzer, above, or a "sticky grenade," dynamite-filled sock, soaked in heavy oil



JUST as the lumbering, armor-clad, terrifying dinosaurs of prehistoric swamps were gradually toppled from their thrones as rulers of the globe and picked off one by one by more agile, though smaller and weaker animals—including the cave man—the huge German tanks of World War II which have dominated the land fighting, are threatened with extinction.

The next few months of battle will tell the story.

If history repeats itself, the new methods and devices produced by American ordnance experts will send crashing to its doom the 40-ton Mark VI type German tank which

handed U. S. troops their initial setback in Africa because of its heavier construction, including steel bodies more than seven inches thick which shed shells as the tough hides of dinosaurs turned the claws and teeth of lesser carnivores. Tanks will become standardized at a smaller type. Our production will exceed Germany's. The tide will be turned.

If the mammoth German tank is not stopped during 1943, the United Nations will be forced into the competition for greater weight and more protective armor and soon the tank is likely to take on the fearful proportions of a house. This works to the advantage of the Germans because the construction of gargantuan tanks will immediately cut our numerical output, force new production plans and increase already strained transportation facilities, with the Germans holding the advantage of defense positions on inside lines.

The importance of the advantage to the German

M-10 tank destroyer has "button-on" knobs for extra armor plates



Mobile, quick-firing artillery is one answer to enemy's armor, above. A final epitaph for the battle behemoths may be written by men like one below, his face blackened in camouflage, who destroys tanks and tank crews





Attack bombers, hedgehopping over a battlefield, as in maneuvers here, mean death to tanks

est development in a caterpillar gun carrier which can out-shoot, out-speed and out-maneuver its gigantic opponents. It is as fast as a light tank, but packs a gun which will stop a heavy tank. It can run circles around a medium tank, though powered by the same engine. It is mounted on an M-4 tank chassis.

Its main gun is of the high-velocity type which is especially designed to pierce armor. It is of welded construction with an open turret and has an arrangement of knobs on its armored surfaces. Additional plates of steel can be buttoned on these before a fight if needed.

The function of this latest "hit-and-run" type of tank buster is not to shuffle around trading heavy punches with a huge German tank, like two heavy-weight palookas in a boxing ring. It takes a position, fires perhaps four or five rounds, speeds to another spot, hurls steel again, and then ducks once more, like a clever boxer outpointing a slow slugger. But the boxer carries a punch, in this case, as lethal as that of the slugger.

A still newer answer to the gigantic German tank

Crews of 37-mm. antitank guns are trained to knock out light tanks, scout cars, armored cars

has been found by the English, who have created "tank buster" planes, remodeling Hurricane fighters so they can carry a knockout punch, too, in the form of special cannon firing armor-piercing shells. Here again it is speed against protective weight for the plane zooms down, plasters the creeping German fortress and wings its way skyward again.

Conceivably the tank could keep on growing until it gets too big for our railroad flat cars and too heavy for our highways, so that it will have to be shipped knocked down to battle areas and assembled there. This weapon is a challenge which must be answered, whatever its size.





If need be, crews of American tanks can quit their vehicles and give a good account of themselves with the smaller weapons each learns to use

And Uncle Sam has found one ultimate answer in the form of paper-skinned, puny-by-comparison machines of war—soldiers who have prepared for a daring future career of “human tank busters” in a school of flame and steel.

At our new Tank Destroyer Centers, picked troops are taking one of the toughest courses scheduled by the army, learning the latest and most efficient tricks of knocking out tanks, big and small, and the enemy soldiers who man them.

The examinations they take in this course are literally tests of fire, for these coverall-clad tank busters inch their way like worms across difficult areas of ground, ducking under barbed wire while machine gun bullets whistle a reminder to keep their bodies down and while grenades and land mines

shower them with dirt and rubble. This teaches them that to smack a tank, they must live long enough to reach it.

They learn to make “Molotov cocktails” by filling a glass container, like a milk bottle, with gasoline which will burst into flames when it strikes the side of a tank, igniting by chemical action. They are schooled in the neatest manner of tossing a satchel of TNT against a tank door and dropping into the best available shelter before the package explodes.

They get the hang of the “sticky grenade” technique which usually consists of filling a sock

with a hand grenade, dipping the thing into a can of thick oil, and with accurate arms trained in America’s sandlot baseball fields, speeding this missile to the precise spot on an enemy tank where it will stick long enough to do the most good for the U. S. A. Sometimes dynamite or some other explosive will accomplish the job if grenades are not handy.

“Kill before you get killed!” is the slogan drummed into these men who fight tanks.

Since the tank is essentially a daytime weapon, unable to maneuver with complete efficiency under the handicap that darkness adds to the clouds of dust and fumes it raises, human tank busters learn to cover any object on their person that might glitter in the sun and draw the fire of the machine gun or larger weapon to the

hideout where they are edging up for a crack at the metal monster. They even smear faces and hands with heavy oil, or some other blackening agent, until they look like the jovial end men in a minstrel show.

But it’s no joking when they get into action. Stalking a tank, they act more like Indians as they slither from cover to cover. Or like famed gunmen of the western plains as they use the fire-from-the-hip technique when a foe is flushed.



Light tanks used to harden crews shown in maneuvers

This latter training is a distinctly American development, built on the fact that when a man is disturbed by sudden danger, his automatic reflexes send him into a crouch from which he can spring. This crouch is the same position taken by the backs of a football team as signals are called.

The stance is superb for close action with a rifle. The man is already alert and poised, facing his target. Jamming the butt of his rifle into his toughened abdomen with one hand holding the stock and trigger, he slides the other hand along the barrel, aims the



Barbed wire is no barrier to tank busters. If they lack time to cut through, they crawl under. Yet another of the mobile weapons that is spelling death to Axis armor is the half-track armed with 75-mm. gun, at a post below



Fast, accurate fire from the "37's," right, helped to end the myth of Rommel's genius

weapon, and before you can say "Hitler" the bullet has started on its deadly journey. The rifle never gets above the soldier's hip and the second that is so important in close action ticks in favor of the tank buster.

Because, in actual battle, visibility is likely to be had where tank treads and shells are stirring up the terrain, one phase of tank buster training includes action inside a black tunnel usually dug out of a slope, where the men are trained to fire at the tinkle of a bell, the creak of a hinge, or the





Don't let the casual nonchalance of these men on maneuvers fool you, for their attitude is born of supreme confidence in their mobile tank buster

almost undiscernible movement of a half-hidden dummy.

"Seek—Strike—Destroy," is the slogan of the tank destroyer schools and one of the places the men get intensive training in the art of doing these three things is the obstacle course.

One such course starts out with a hundred-yard dash, but there is no tape to mark the end of the sprint. Instead, the tank buster finds himself hurtling over a steep bank into a rocky stream. Those who are unable to negotiate this obstacle under their own power are hauled out by lifeguards and sent after the others who by this time are clambering over a series of three waist-high fences which only lead to seven-foot walls.

After this, the going begins to get really tough because there are forty yards of barbed wire under which they must wriggle in clothes soaked by the water of the stream. Next comes the huge brush pile complicated by more wire to trip the unwary. Next is a sixty-degree plunge down a slope with ledges and roots for foot and hand holds. Another hundred yard dash completes the course, some of which is covered under the fire

With tank busters to knock out enemy armor and "honeys" like this M-5 to carry the ball, U. S. builds a victorious combat team

of machine guns with tracers and explosions of dynamite to make things more lively.

Officers take the training right beside privates.

These human tank busters are just one more variety of a number of expedients which make a tank vulnerable. It is like the traditional story of the towering and massive elephant fearlessly battling any large creature, but fleeing in terror from a mouse because it cannot prevent the tiny rodent's climbing inside of its trunk.

Almost any type of gun is effective to some degree against a tank. Dive

bombing planes can split them wide open with a direct hit and often cripple them with a near miss. Barriers of steel and concrete often stop, impale or topple a tank. Land mines either crack their treads or blow out their more tender under sides.

More vulnerable than the tank itself are the crews, jolted and pounded by the rough going, stifled by fumes, choked by dust, deafened by noise, tortured by heat and splattered by fragments of machine gun bullets which are smashed to bits when they hit the tank armor so they sometimes spray into holes in the steel vehicle.

Even if a missile fails to penetrate the tank, the concussion of a direct hit will often transfer itself through the armor with disabling results to the men inside, espe-





Bursting from their M-3 in training at Fort Knox, tankmen practice close-range fighting

cially to the observer who has his eye fixed against the periscope-telescope.

All of this sounds as though the tank crew is in a bad spot, but few men trained to this work would trade places with troops in the other branches. After all, they argue, it's nice to have at least a few inches of steel between you and the enemy.

Uncle Sam is doing everything possible to protect our own tank crews against the tank busters of the Axis nations. An escape hatch is being installed in the latest M-4 and M-5 tanks. All of our tanks are streamlined to deflect shells, and welding has eliminated rivets which tended to fly like bullets inside the tank when it was hit by heavy caliber gunfire.

Crews wear webbed suspenders so that they may be hauled from the turret if wounded.

So the constant conflict between tanks and tank busters continues as a war of wits, each side seeking an advance which will throw the balance in its favor. Our tank busters are gaining in the struggle, thanks to our scientists and engineers and the brave lads who fear nothing—even goliaths which spit steel.

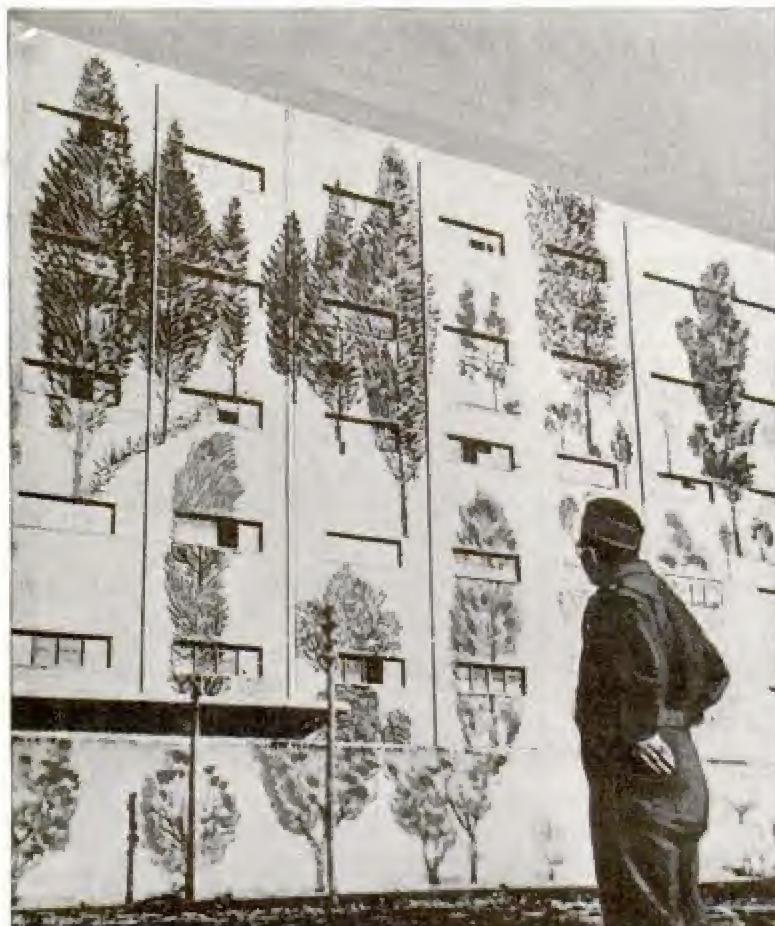


Veritable land battleship is the M-4, shown topping ridge in test run above. Below, the M-5 proves its fleet power by overrunning debris that in battle might house a sniper



Chicago Carpe

71246 "Wooded Hillside" on Building Is Effect of Camouflage



Facade of building resembles a wooded hillside to enemy's reconnaissance

To distract bombing or strafing enemy planes, camoufleurs converted the wall of a building near Tripoli into what would serve as a stage backdrop by painting its surface with trees. The effect of a wooded hillside was apparently sought to justify the height of the verdure above the surrounding ground.

71388 Air Conditioning of Cities Foreseen in Future

It is time that man begins thinking of "air-conditioning" entire cities, in the view of Prof. Albert E. Parr, director of the American Museum of Natural History. Man, he holds, is still fighting weather by housing and clothing, exactly as primitive man did with his cave, animal skins and fire. He said he should like to see meteorologists offer a "city plan which would create a city of calm in a windy location," and to see them take a

hand in determining the use of heat-generating or light-reflecting facades in city building. A limited but quite considerable amount of outdoor air-conditioning, he declares, is perfectly feasible by intelligent application of meteorological principles to city planning.

7184 Two-Seat Scooter Uses Tires From Wheelbarrow

Parts from a variety of other machines went into the manufacture of a two-place motor scooter, powered by a three horsepower motor. Wheels were taken from two wheelbarrows; the headlight was once an automobile fog-light, reequipped with a clear lens and high- and low-beam bulb controlled from the instrument panel, which also has an ammeter, ignition switch and electric starter switch. The transmission is a three-speed motorcycle type. Two handlebar grips control the throttle and clutch. A small generator and battery power the electrical equipment. The scooter can hit 40 miles an hour, and runs 60 miles on a gallon of gas.



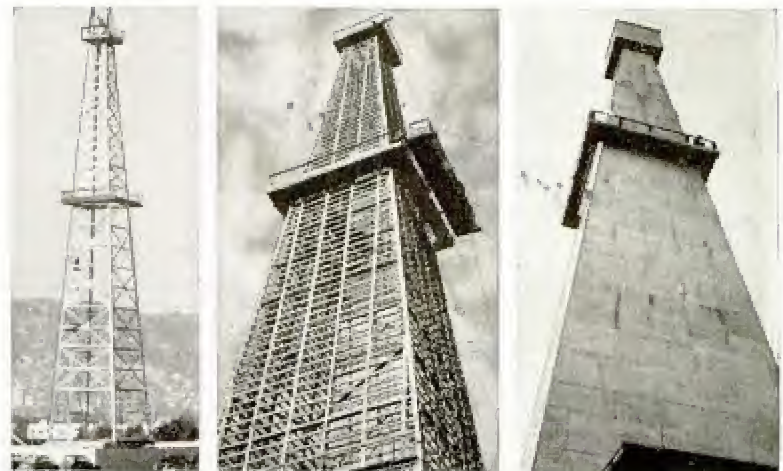
Parts from automobile, motorcycle, and even wheelbarrow went into this motor scooter, running 60 miles on a gallon of fuel

M. W. Schppard, Jr.

77282

Oil Well Near City Homes Is Soundproofed

No mechanical noise disturbs the rest of slumberers in homes near **Shell Oil Company's "Verne Community No. 1"** drilling, though it is in the heart of residential **Los Angeles**. The derrick and all machinery are swathed in rock wool and enclosed in mineral board, making the operation soundproof and fire-proof, to demonstrate that drilling can be done in residential and business districts without objectionable noise. For power, electric motors instead of steam engines are used, and instead of the clanking usually associated with oil drilling



Progressive stages in soundproofing of oil well located near city homes

there is only a discreet hum, further muffled by rock wool enclosing the powerhouse.

Ropes Set Off Arc Explosion in Electric Overload Test

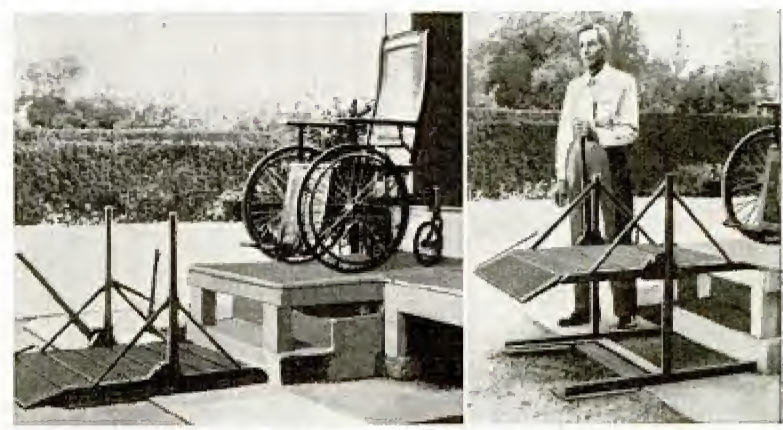


Deliberate overloading of a service type electrical switch, in a test to determine how much current its materials and construction would withstand, resulted in an intense arc resembling an explosion in the **Underwriters' Laboratories, Inc.**, testing station. The testing engineer wore an asbestos jacket and a helmet for protection, and operated the switch by remote control with ropes for safety.

To determine current an electrical switch will withstand, technician causes an arc "explosion." Use of ropes to pull switch is for safety

Portable Wheelchair Elevator Lifts Patient Over Short Flight of Steps

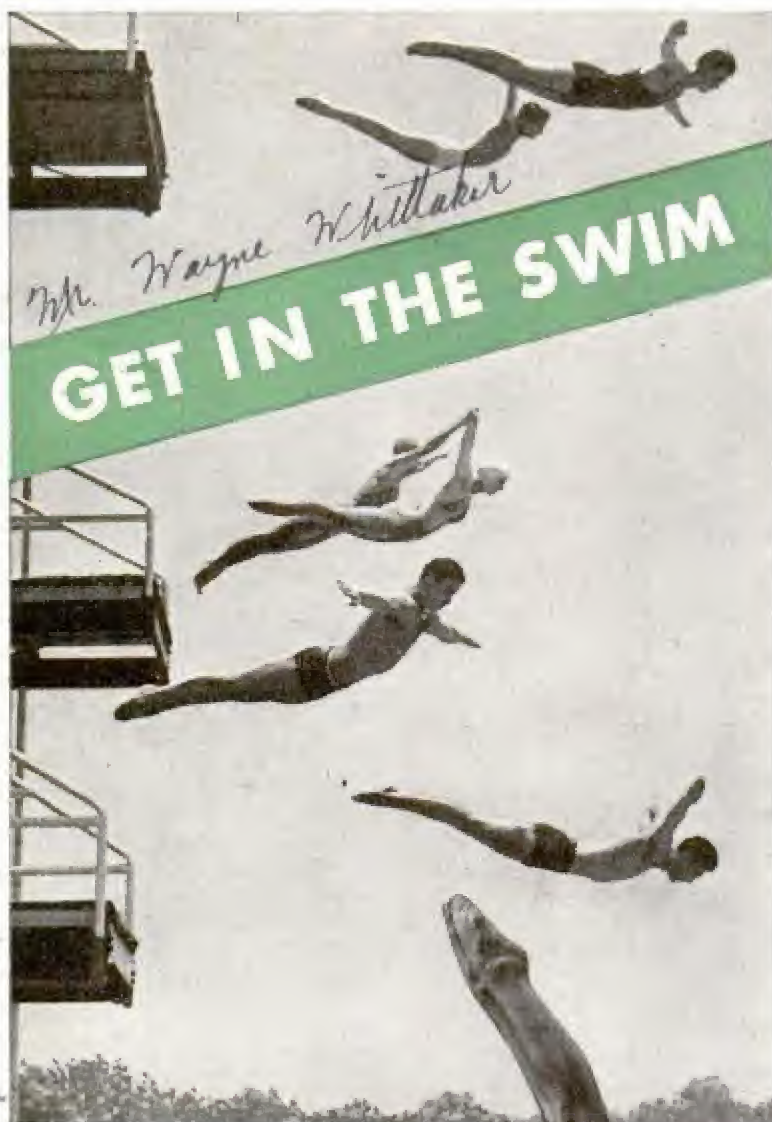
Persons confined to wheelchairs may be readily transported up and down short flights of steps, such as those leading to a porch, by a wheelchair elevator operated by a handle lever. Made of lightweight steel, the elevator can be carried from place to place and is rapidly installed in position. The patient himself may operate the lift while seated in the wheelchair, or it may be operated by an attendant.



Wheelchair elevator is readily transported to steps (left). Patient or attendant can operate lever that raises and lowers it to porch or ground

Ernest Janning
1032 W. Caden Dr.
Los Angeles, Calif.

P. G. Welby, Jr. Mgr.
Underwriters' Laboratories, Inc.
207 C. O. Bldg.
Chicago, Ill.



their swimming in the neighborhood pool or the old swimming hole. There are dividends, too, in health and the glow of pride in developing average ability to near-championship performance. There's also the chance that someday you may be able to save your life or that of someone else.

"One of the biggest mistakes amateurs make is to breathe in four times as much air as they need," says the noted coach, who is chairman of the committee on lessons of the U. S. A. Sports Federation. "This is easy to do, for when you inhale through your mouth, as all swimmers do, it's natural to take in more air than is necessary."

Too much air will wear you out before you get across the pool. You can get a similar effect when walking along the street if you take a deep breath through your mouth every time you put your right foot forward. After a number of steps you become dizzy and exhausted. That is what happens to many swimmers, for it takes no more energy to swim than to walk.

After you have learned

SAVE your breath and improve your swimming. Most amateur swimmers—and some stars—worry too much about their over arm stroke, their kick, and just how far to pull back on the breast stroke, according to Coach Edward Wallace "Wally" McGillivray of the University of Chicago, who in the last 19 years has guided many a swimmer to national fame.

Wally McGillivray—three-time holder of national championships for the breast stroke, the first aquatic star to swim 100 yards in less than a minute, and credited with originating the American crawl (which has made the Australian crawl as dead as a dodo)—knows whereof he speaks.

With gasoline rationing nipping plans for vacation trips and even short jaunts to golf courses, Coach McGillivray figures that this summer is the ideal time for enforced stay-at-homes to improve

A hickory limb would be a handy place to hang your fears when you step off high boards above. Below, a champion diver shows how to cut water like a knife; note position of head and arms. Copyright Planet News, Ltd.

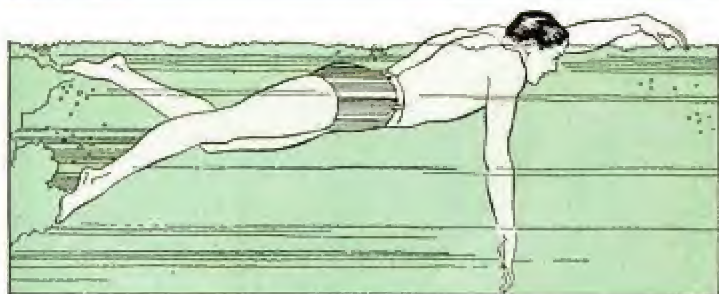
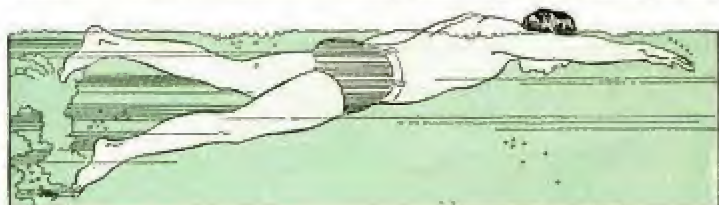




Above, correct way to take a breath while doing crawl. Right, for crawl stroke body should lie flat, water level just above eyes. Long stroke ending below hips gives steady push

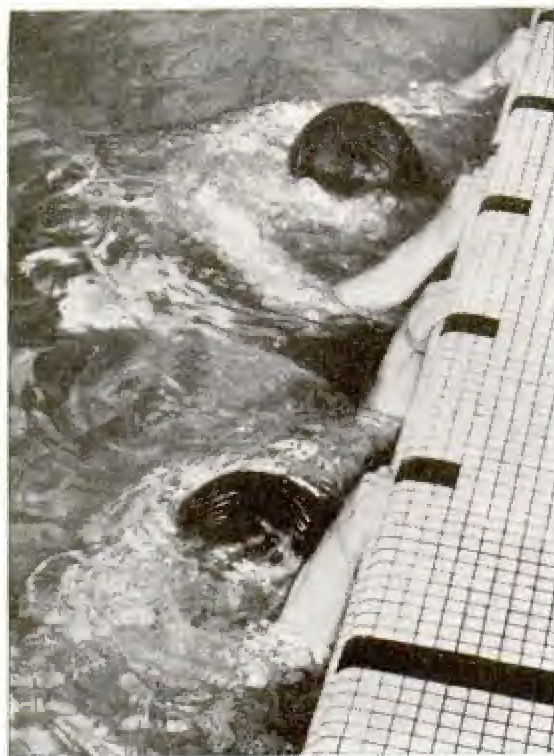
not to take every breath as if it were your last, it is important to master the technique of exhaling under water and inhaling without lifting your head high. When inhaling while doing the crawl, a twist to the side will suffice without robbing you of momentum or causing your body to sag like a bag of grain. When it comes to exhaling under water, it's largely up to the individual whether he prefers to exhale through nose or mouth. Coach McGillivray prefers the latter because, he says, it is easier and there is less danger of forcing water into the sinuses.

Wrong way to breathe, head held high



Next in importance to rationing your breath is improving your kick. First of all, forget everything you've ever heard about not bending your knees.

"The amateur swimmer has been told thousands of times not to bend his knees when he's doing the crawl," said Coach McGillivray. "What the well-intentioned instructors mean is 'don't draw up your knees'. Anybody can see that you have to bend your knees to get a revolving propeller kick such as is used by Johnny Weismuller, Adolph Kiefer and all the big stars. Watch this."



Five minutes of this exercise, exhaling under water, will teach anybody to relax, says Chicago coach

The coach lifted his foot, toe pointed down. Then he started an easy motion with his leg, swinging it back and forth, and as he moved it the relaxed foot began to revolve. As he increased the tempo his foot was whirling like a propeller with his knee slightly bent. That's the correct leg work for the American crawl.

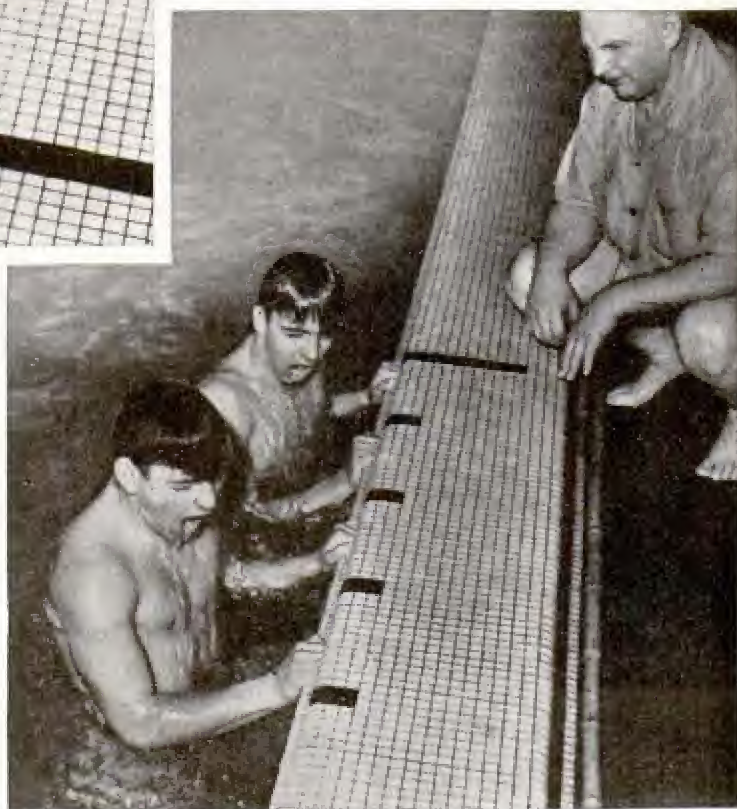
"Like a lot of other things, the American crawl was discovered by accident," he said. "When I was a kid I used to spend my summers at a lake. I'd sit on the end of a small boat playing steamboat by the hour while my father rowed. I pretended my feet were twin propellers. One day after a swimming meet at the old West Side Y.M.C.A. in Chicago, I was fooling around in the pool doing that double propeller kick while hanging on the rail. The coach said: 'Say, kid, can you swim double over arm and keep your feet going that way?' I did, and he timed me. Then he gasped: 'My gosh, you broke the world's record!'"

The record for the 100 yard free style at that time was held by H. J. Handley. McGillivray was the first to swim it under one minute—57.4 seconds. The record for

this distance is one of the most coveted in some 60 swimming events. Weismuller swam it in 51 seconds in 1927 and held the world's record until this year when Alan Ford of Yale broke it by three-tenths of a second.

Much has been written about the famed Jap swimming stroke since they walked off with Olympic honors in 1932. Coach McGillivray thinks it's high time somebody spiked the notion that the Japs added something new to swimming technique.

"The Japs seem to practice their imitative monkeyshines in sports as well as industry," he said. "In 1930 the Jap coach visited me at the university. I had been having trouble getting the swimming team out for practice due to a heavy class load



so I had posted full instructions for the propeller kick on the bulletin board. When the Japs came out with their winning team in 1932 they had copied my kick and somebody else's stroke and were credited with developing a new style. Coach Amos Alonzo Stagg happened to be at the meet and he sent me the Jap coach's written explanation of the kick. It was word for word what I had put on the bulletin board back in 1930."

In doing the crawl, the body should lie in a flat position with the head and chest fairly high and the water level at the eyebrows. Avoid exaggerated lunging or rolling and remember there should be pressure



Copyright Planet News, Ltd.

This is a "horseback" dive—a good stunt if you know how—and recommended only for the diving experts

on the water at all times, for most of the propulsive power comes from the arm stroke. When you bring your hand forward for the "catch," it should be in line with the forearm and lower than the elbow. To develop a powerful stroke, practice reaching forward as far as a high elbow will permit and pull the hand through the water slightly toward the middle line of the body. The "catch" should engage a maximum amount of water with both hand and forearm throughout the stroke.

In case you happened to grow up without learning to swim, don't think it's too late to start now. And don't think you'll have to waste a summer at learning either, for you can learn to swim in 40 minutes if you follow Coach McGillivray's instructions. He proved this recently by teaching 50 army cadets in just that time. None could swim a stroke before the lesson.

First the coach lined them up in the pool along the rail. For almost five minutes he kept them bobbing up and down, taking a breath and then going under to exhale. You can't keep up an exercise like that for five minutes without learning to relax in the water. That's why this is No. 1 on the program.

After showing them how to do a breast stroke, he had the cadets stand in the shallow end of the pool and practice a circular

motion just beneath the surface with their hands. Then he told them to press down while making this motion, showing how they could hold themselves up. This was followed by several minutes of kicking practice while on their backs hanging onto



Swimmers in national high school Victory swimming program learn to handle dummy rifles in the water

Courtesy Chicago Board of Education



Man with wings—an unusual shot of a graceful swan dive

the rail. In doing the breast stroke the timing between arms and legs is all important. The best advice, according to the former champion, is to take a stroke with the arms, then kick, and never pull the arms back farther than the shoulders.

After the cadets had added the kick to the stroke, every man swam across the pool. It took exactly 40 minutes and these cadets were not supermen.

While improving your swimming, you may also wish to brush up on your diving so you can at least get into the pool with a minimum of embarrassment. Remember, warns Coach McGillivray, that your head rules your dive.

If you are making a forward dive from the edge

Coach McGillivray shows position of feet for "propeller" kick

of the pool, keep your head down or you'll go kerplunk. Stretch for the water and keep your head between your outstretched arms.

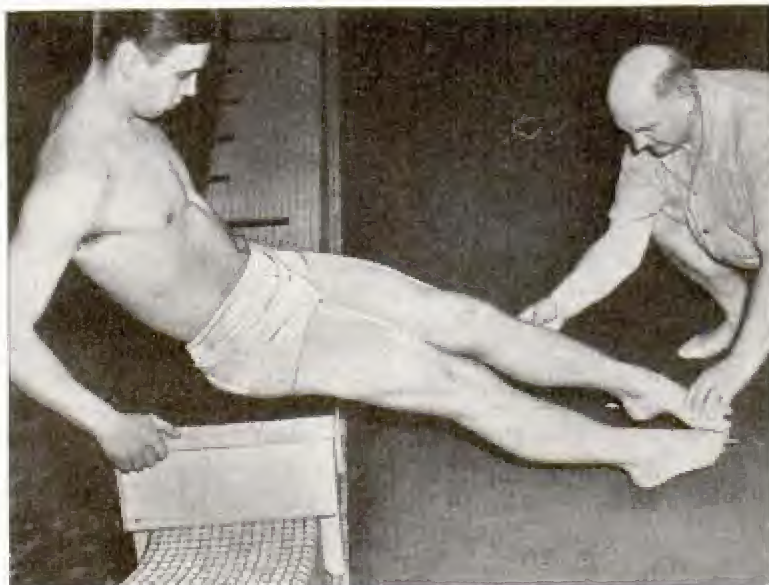
If you are a diver and have trouble with your fancy dives, remember your head again. In doing the backward dive, keep your head well back and don't bring it forward or you'll be in trouble. The same general rule applies to the twist dives. Keep your head to the side and look over one shoulder.

Also, when getting acquainted with your neighborhood pool this summer, Coach McGillivray advises strict adherence to two well-known Red Cross rules. Never go in water that is over your head alone, and never go swimming until at least one hour after eating, preferably three. A stomach cramp can render you so helpless that you can't move a little finger. And if you get a cramp in your foot straighten it at once by pulling on it hard or the foot will bother you for days.

Swimming, says the coach, is the most healthful exercise there is and is the best body builder. The reason for this is that there is no "tearing down" of muscles in swimming like there is in golf, tennis, football, basketball and other sports. That is why swimming is used as a body builder for

persons afflicted with infantile paralysis.

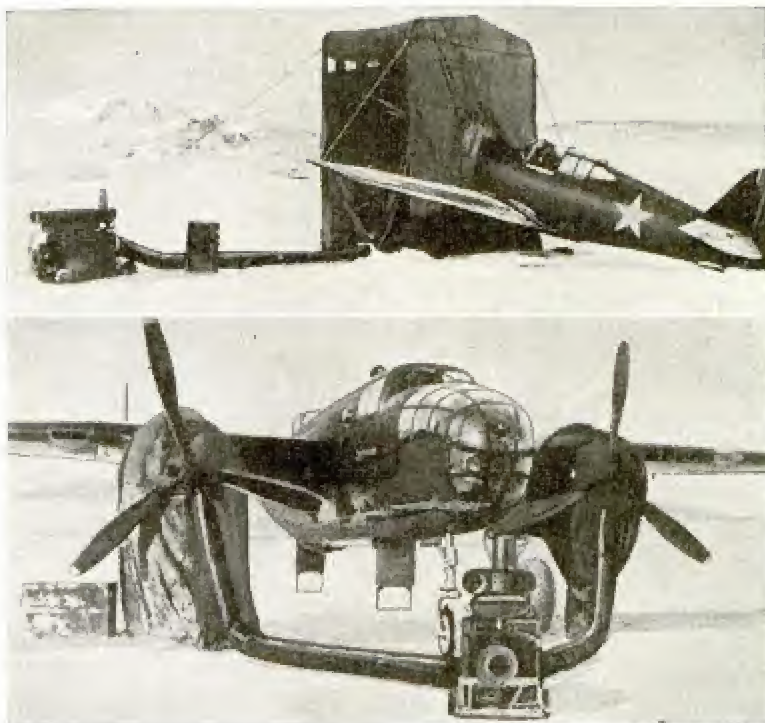
So get in the swim and build up your health and have fun at the same time. But while you are doing it, don't forget to save your breath.



Plane Motor Pre-Heated for Arctic Takeoff

Army Air Force fighting ships based at Alaskan airfields may often have to operate in temperatures far below zero—cold so intense that engines cannot be turned over until they have been heated. A portable gasoline heating plant warms the motors in advance of starting, saving time and wear on the motors as well. A motor-driven fan blows hot air into a tent-like covering of the motor, forcing the warmth to circulate into the vitals of the machinery, warming the metal and the lubricant as well. Tents may even be large enough to house mechanics at work.

Gasoline heater blows hot air into tent to warm plane motor
U. S. Army Air Force photo

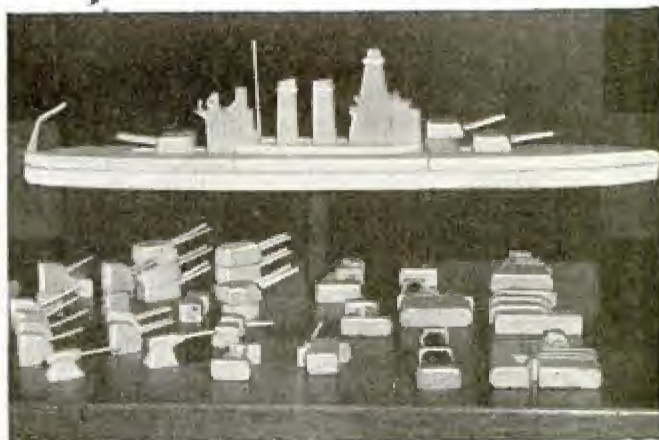


Fliers Identify Warship Types by Studying Wood Models

How to distinguish between friendly and enemy ships, and to identify a battlewagon, cruiser or other type is taught army aviation cadets at a Texas flying school by means of ingenious wooden models designed by Lt. Bernard A. Anderson. Chief identifying points of a warship are the masts, turrets and stacks. From heights of several thousand feet, fliers would probably be unable to distinguish the finer points of the ship's appearance, so they are not included in the models Lt. Anderson uses. With one model, sawed and carved out of 55 pieces of white pine, Lt. Anderson is able to "construct" any surface craft in the American navy by arranging various combinations of the turrets, stacks and masts. The entire set can be easily packed into a small box. Ability to identify a warship at a glance means that a flier would waste no time debating whether the vessel was friend or foe; would know immediately the strong and vulnerable points of the vessel, and would be able to report accurately the type of vessel attacked.



Ships are identified by masts, stacks and turrets. Above, placing turret on battleship; right, second model and complete kit



*Mr. Albin Warren C. Smith
7 Pickers. N.Y.C.*

71 201

MINING BLACK GOLD for VICTORY



far from the new Alaska Highway which links the United States with Alaska and because they are very close to the alternate route which is projected for the strategic road, the oil-bearing sands bordering on the river are a weighty item on the scales which will measure ultimate victory. To wrest the oil from the sands, a hardy group of pioneers of the north woods is busy night and day, pioneering in bizarre oil field methods.

Open pit mining of minerals such as iron is not novel. Nor are blasting operations in the digging

Left, squeezing oil from gummy oil sands deposit in Canada—world's oddest "mine"



IN THE bitter struggle for control of the world's natural resources—metals, minerals, rubber and oil—the United Nations were favored with one of the strangest breaks in history. One of the most remarkable oil fields on the face of the globe, a huge stretch of land bordering on a river, was found in northwest Canada where anyone may reach down, pick up a handful of sand and squeeze out the precious black gold.

It's not news that there is a 10,000-square-mile area of prehistoric mineral-rich oil sands in the northeastern section of the province of Alberta. White men first learned about it in 1719 from Indians paddling into trading posts in canoes which had been waterproofed by "stickum gum which flows out of the banks of a river."

The rugged Hudson Bay traders did not know what to do with the pitchy substance that Indians dug out of the river bank. Later, when the miracle of petroleum and its products was unfolded by science, there were other and easier sources for black gold. The oil fields of the Athabaska River were practically forgotten because they were too distant from transportation.

Right now, because they are situated not



Photos by Hamilton Wright Organization, Inc.

Oil sands prospectors carrying tools over swinging bridge as they push on to make tests of new field

of coal. The use of bulldozers to move earth is common to mining, too, along with rubber conveyor belts and flotation processes. To those who think of an oil field as a place where the black gold gushes from the ground, or is pumped up, the employment of these processes in connection with producing oil would be a surprise. A veteran oil man watching the operations of the recently built plant in the wilds near McMurray in the Athabaska River area, some 300 miles northeast of Edmonton, Alberta, might be startled.

This pilot plant at McMurray is located in an area already surveyed by geologists. S. C. Ellis of the Dominion Mines Branch, who is regarded as the "Father of the oil sands development in Alberta," has devoted more than 20 years of exhaustive research through-



Steam drill making deep hole for dynamite to loosen sands

out the Athabaska region. On innumerable occasions he has sampled oil sands deposits and assayed their petroleum value. Virtually any site or location within a short distance of the plant has been found suitable for oil sands mining operations, and it is here that the principal activity has been centered in recent months.

A hole is drilled, black powder or dyna-

mite is inserted, and the sand formation is loosened by a blast. This not only makes it simple for power shovels to fill "carryalls" with the mucky lumps, but the explosion has the effect of separating grains of sand from the precious oil films which surround them.

The carryalls dump near a conveyor belt onto which the bulldozers shove the oil

Bulldozer shoving rich oil sand onto long conveyor belt which carries it into the plant's oil separator





↑ Operating open pit oil "mine" near "pilot" plant in Alberta

sand "ore." Up the belt goes this material, to be loaded into a slowly rotating horizontal cylindrical steel pulper which is equipped with internal steel coils and baffles. After a thorough shakeup, the sand goes into another similar machine which duplicates the process. By this time, the oil which clings to the sand as a film is ready to let go, scoured off by the abrasion of sand grains as they collide.

Sand and loosened oil are dumped into a patented flotation cell which contains water. Air forced into the mixture picks up the oil particles and they are carried to the top of the water in the form of bubbles. The crude oil is then skimmed off like cream from the top of milk. To get the most out of the sand, it goes through the same process again before being discarded.

As the oil froth comes from the flotation cells, it contains mineral matter so it is mixed with a naphtha diluent and tossed into a settling tank where the water and mineral content go to the bottom, the clean crude to the top.

From this point on, the pilot plant operates as a small refinery and even the gasoline which drives trucks, power shovels,



Left, oil from sand on its way to make aviation fuel and rubber

carryalls and bulldozers over the sand is supplied by the liquid taken from the sand dug from this unique "oil mine."

This pioneering promises the United Nations real wealth in oil—huge quantities of it, enough to supply the world's needs for the next hundred years or more. The amazingly high ductility of this oil may solve the problem of supplying synthetic rubber to the armed forces with a surplus for civilian requirements. An asphalt of excellent quality is pro-

duced from the oil which may be used to surface a new highway rivaling the best the Romans built 2,000 years ago.

Alberta's native oil sands have been weathered for 180 million years. It has learned the hard way to contract and expand in temperatures which range from 90 degrees above to 56 degrees below zero. Consequently, the asphalt product developed from these oil sands is peculiarly adapted to the surfacing of highways throughout the northwest and will find practical use in surfacing the Alaska Highway. Weathered by nature and possessing qualities of persistency that will make unnecessary frequent repairs, the Alberta oil

sands solve a problem that has vexed highway maintenance experts for years. Samples of this excellent surfacing are to be found in Edmonton, capital of Alberta, where sections of roadway which were laid in 1913 have never developed cracks or other fissures nor have they required as little as 10 cents worth of repairs in more than 20 years.

High octane gasoline, tractor fuel, Diesel fuel, coke and asphalt are the immediate products in view from this black gold. Nobody really knows how much oil is in this fabulous region, but American and Canadian geologists say that a hundred billion barrels are not too high a guess and that even 250 billion barrels are within the realm of possibility. The present known oil resources of the world are perhaps 35 to 40 billion barrels. The extent of the development of the oil sands begins to take on astronomical proportions.

Last summer, C. D. Howe, Canadian minister of munitions and supplies, launched an exhaustive investigation of Canada's oil resources and specifically listed the Athabaska oil sands as a potential producer of vital war materials. Oil engineers and transportation officials visited the region to consider the complex phases of the project. Results of these investigations have not yet been made public but the speed with which the Alaska Highway has been completed may provide some of the answers.

The sands are an ancient delta, or estuary deposit, washed into a shallow sea many million years ago and later buried beneath thousands of feet of sediments. In time, these were consolidated into sandstones and shales.

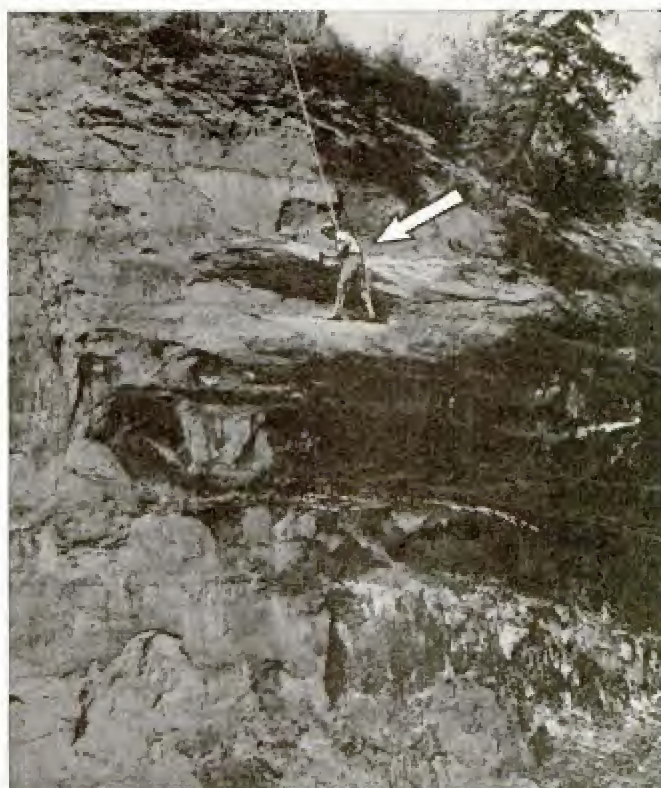
At some time and in some manner, about which there is much speculation, the sand became saturated with heavy oil. More recently, the Athabaska River and some of its tributaries have cut valleys through the overlying rocks and through the oil sands, leaving shelves in the oil sands, some of them of large extent, along the valley walls.

It remained for Max W. Ball, a geologist who was once a member of the U. S. Bureau of Mines, to

(Continued to page 150)

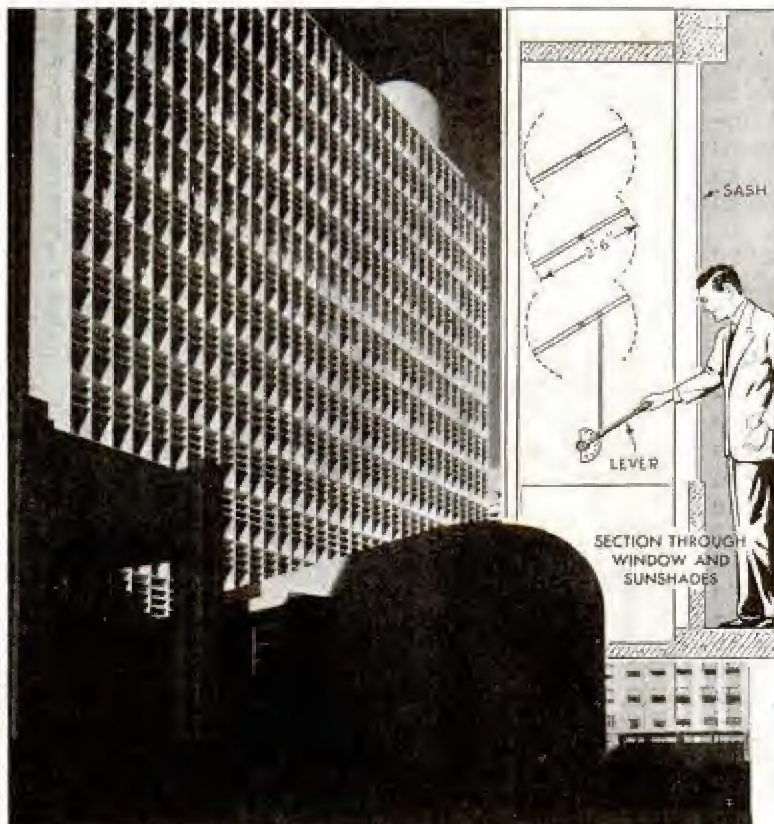


Rubber belt on conveyor lifts tarlike sand from pit to processing plant. Below, a geologist is lowered by rope on sand cliff



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Building's "Eyelids" Are Adjustable Sunshades



For subtropical areas, where the blistering heat of the sun would turn offices into ovens, movable sunshades, like oversized Venetian blinds, block the sun's rays while permitting air to circulate freely. Windows for each office are equipped with a manual control which adjusts the blinds to regulate the amount of light. Brazil's Ministry of Education and Health building, so equipped, has the sunshades on each window of the north face of the building (which corresponds to the south face of buildings in the Northern latitudes), while the south face of the building, needing no such protection from the direct sun, is entirely of glass.

How sunshades keep out direct rays of Brazilian sun (left); diagram shows their operation

Glass Cage on Solder Pot Guards Workers From Burns

Speed and safety in tipping electrical wires with solder are claimed for a development at Bell Aircraft Corp., using glass-shielded pots set in the center of a cross-shaped table, which permits four persons to work simultaneously at the one soldering pot. The glass shield protects workers from flying drops of hot solder, and makes the use of goggles unnecessary. Air circulates through the shield to prevent clouding of the glass. The pots are set in asbestos, the bottom portion being encased in a metal casing which protects workers against burns, that might be suffered if their legs touched the pots.



Glass shield protects workers tipping wires from flying bits of solder

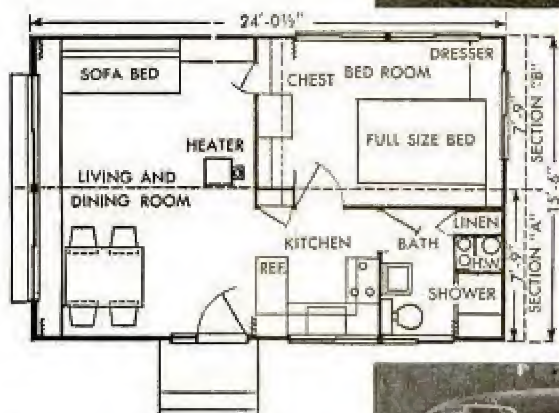
Ⓢ Russia is young, 45 percent of its near 200,000,000 people being under 19.

2050 Colman Ave.
 Buffalo, N.Y.

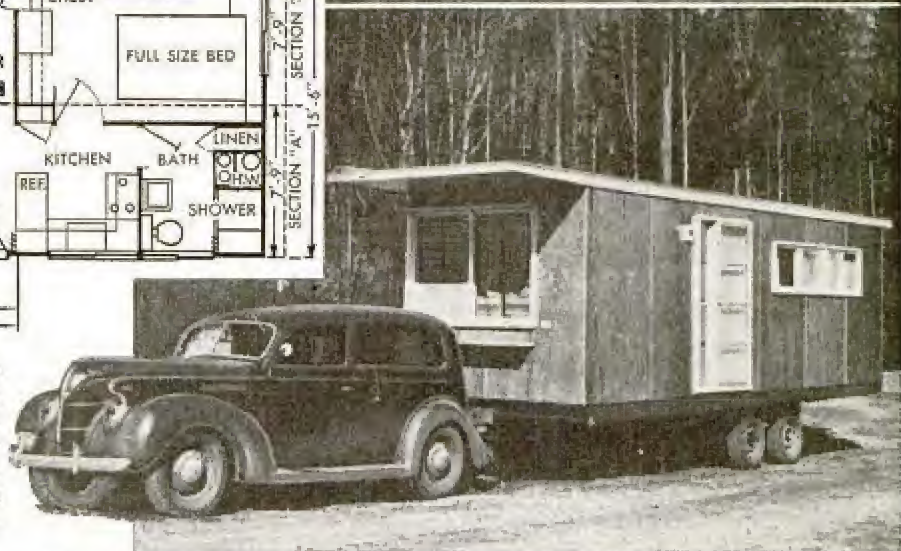
Clark, Ind.

Two Trailers Combine Into Furnished Home

To meet the housing demands of workmen who must move to a new site when a project is finished Schult Trailers, Inc., designed a two-section trailer house. It is delivered as two trailers on a removable chassis, with a concrete foundation, and equipment to slide the house onto its new site supplied by the maker. All furniture is built in, including beds, dresser, tables, curtains and cooking and heating stoves. At right is a view of the bedroom, showing the full-size bed and the built-in dresser. There is also a combination living-and-dining room, as well as a kitchen and a bathroom



Floor plan of double-trailer house, above, with dotted line down its center showing how two halves are joined. Construction material throughout is plywood



How the house is transported in sections is shown above: half a house arriving on a trailer. At left is a view of the completed house. It is designed for maximum light and air. Cost of the house is about \$2,000, although all currently being built will be sent workmen on southern dam projects. For the period after the war, the manufacturers hope such a house will find a market among vacationers, as well as among workers on temporary jobs. The two halves of the house are bolted through floor studding, sides united with spline joint. The roof has a transite pipe cap through which screws are placed. Standard wiring enables the owner to plug into outlets anywhere. Two men can erect house in one day

James Colvin
Capt. Theodore Miller

77 2064



HOSPITALS UNDER FIRE

Field hospital tents house the best equipment and the finest technicians the nation can offer its fighters

By James Colvin

IF THE BEST medical care in the world can save them, then the overwhelming number of America's war-wounded will live to fight again.

Of one group of wounded Yanks, more than 99 in every 100 recovered. That record, admittedly, is so remarkable that no predictions are being based on it. But Army medical men are confident of a recovery record much higher than that of

World War I because the generation since 1918 has been blessed with three aids that combine to create life-saving miracles.

They are blood plasma, the sulfa drugs, and an "assembly line" of medical services that assures treatment in the vital first hours after injury.

Terming the fighting Yank's medical care the world's best is not idle boasting; the figures prove it. There is one doctor

for roughly every 125 fighting men. Compared to this, the United States is aiming at one doctor for every 1,500 civilians; England has one doctor for every 2,700 civilians, and Germany reputedly only one for every 12,000 civilians, besides fewer than half the number of doctors America has assigned to comparable numbers of troops.

"Modern surgical care will be one of the factors in a successful outcome



Planes speed wounded men to hospitals safe from enemy fire



Jeep is readily converted into ambulance to carry wounded to safety, as in demonstration above

"Scrubbing" in preparation for surgery is a rite in the field (right) just as it is in spotless clinics

for the United Nations," Dr. Emerson Crosby Kelly of Albany Medical College declared in a General Electric Science Forum address.

But long before the surgeon even sees the wounded man—long, as battlefield medics now measure time—he has been given first-aid treatment to overcome shock and infection, both of which claimed many lives in World War I. Blood plasma reduces or eliminates shock; the sulfa drugs combat infection. The third medical weapon is speed.

A wounded soldier may easily be given first aid in 10 minutes, and be on an operating table, under the knife of a surgeon famed in civilian life, within half an hour. And speed of this sort saves lives.

Medical men go into combat with the fighters, though "armed" only with a Red Cross insignia. They march up with the infantry; they bail out with the paratroops; their foxholes are as advanced as any in battlegrounds like those of New Guinea. The enemy doesn't always see that little Red Cross armband; he doesn't always choose to see it. Medical aids may be wounded as quickly as any other soldiers.

They are the advance guards for dressing stations that may be only 50 yards from the trenches. They spot the wounded, apply first aid, jab a flag



Mule-carried litter designed for a Field Artillery outfit



Photos by U. S. Army Signal Corps

On inland streams, wounded may be transported on "bancas," native boats

or bayonet into the ground to guide the stretcher bearers, then crawl ahead to repeat the procedure with another injured man. The stretcher bearers tag the wounded man and take him to nearby field dressing stations, which often are portable hospitals themselves.

Stationed there are heroes as yet unsung, but whose deeds will be indelible in the records of this war. They are the doctors who give the initial quick treatment—under orders to stick to their posts no matter how the battle's tide may turn. If the

enemy scores an advance, these minions of mercy may be captured or killed; no matter; their task is saving others' lives, not worrying about their own.

The field dressing station is the first stop in the medical assembly line. Here a field casualty card is attached to the patient, showing the general nature of the wound and the time it occurred. From there, patients are moved by stretcher or ambulance to the next stop, the classification post or clearing station. Here the wounded are separated according to the seriousness of their injuries and the urgency of treatment.

They may next be moved by ambulance convoys to one of three types of hospitals: the surgical hospital for men needing operations quickly; the evacuation hospital for nonsurgical cases and movable surgical cases; and the convalescent hospital for men who will be able to return quickly to the front.

There may be a final move in the trek to recovery. Some few men needing longer care, or more specialized care, may be sent all the way back to the United States.

Probably no medical men would wish to

Close at hand when accidents occur, Medical Corps men apply a splint to a soldier's broken leg in maneuvers



say which of the three—plasma, sulfa drugs, or speed—saves the most lives. But these three, along with better initial training for the troops, are accomplishing a recovery record with which the World War I rate cannot compare.

In that war, between seven and eight percent of America's wounded died. In this war, of the men wounded on Guadalcanal—exclusive, of course, of battle deaths—fewer than one percent died. Only five percent of the men with abdominal wounds died; last war between 70 and 80 percent did.

America's experience may not exactly parallel Russia's, but it is safe to predict the



Speed in removing a man to field dressing station may save a life



overwhelming number of wounds will be caused not by bullets but by shrapnel and shell fragments. In World War I, 50 percent of the wounds were so caused; in Russia in this war 95 percent are caused by shrapnel and fragments.

Shock, the wounded man's first peril, is a disorder of the blood stream, in which the body tissues apparently absorb the blood's natural plasma. To prevent this, a transfusion is often given right on the field. Every pint of civilian blood donated potentially means a soldier's life saved.

Infection is the second peril, and to prevent it every soldier in battle is supplied with field dressings and an envelope of the new sulfa drugs which he himself can dust

Litters on log rafts are propelled across streams by men swimming
Soldier is removed from a bicycle litter to a bus bearing Red Cross





Net above pack holds 50 pounds of medical equipment

into his wound if other help is not immediately at hand. First-aid men who will probably be at his side in a few minutes will also be supplied with the sulfas, perhaps in pills for the patient to take orally before he is moved.

British authorities believe the sulfas are so miraculously effective because they "deceive" the body's bacterial enemies. The bacteria appear to mistake the sulfa drugs for a chemically similar, vitamin-like substance which the bacteria need for growth. When the bacteria consume the sulfa instead of the vitamin, their growth is inhibited, and the blood's white corpuscles more easily overcome them.

Whatever further impact the sulfas may have on medicine, the Army has learned they decrease remarkably the number of wound infections, allow the patient more comfort and promote rapid healing and shorter hospital terms.

Stretchers are used to portage supplies over rough terrain to a forward post

It is not unusual for front-line hospitals to combine medical specialties that before the war were rarely assembled anywhere in the world. Teams of specialists, experienced surgeons with their own assistants, anesthetists, nurses and orderlies, make up the staffs. One team may operate on men with chest injuries; another on those with abdominal injuries, and so on.

Thus America's wounded have advantage of not only the finest equipment but also the best techniques. Anesthetists may use the old standby, ether, spinal anesthesia, or the new intravenous anesthetic which usually puts a patient into a deep sleep before he can count ten. Splints of endless variety are at hand; tannic acids for burns; compound fractures may be treated by the "Orr-Trueta method," first used in the Spanish Civil War. In this procedure the fracture is cleaned, sprinkled with a sulfa drug, and the broken member is encased in a plaster cast, not to be disturbed or changed until healing and union have taken place.

Other techniques include treatment for everything from poison ivy to severed nerves. Upwards of 15 percent of all casualties in army camps of the southeastern United States are caused by ivy poisoning. An extract from the ivy itself, injected into the muscle of a poisoned soldier, has been found to give quick relief and avert long hospitalization. Severed nerves are actually being rejoined by grafting sections of other nerves between the broken ends, and joining the graft with gum acacia "glue."

Land transport of the wounded may be accomplished by stretcher bearers, don-



Cont: Mrs. Warren Elliott

71238

keys, horses, camels, elephants, carts rolling on bicycle wheels, normal-sized ambulances, huge vans carrying 20 patients, or, in swampy territory, amphibian tanks.

If the battle area itself is too limited, or otherwise unsuited, to accommodate a well-equipped hospital, air transport whisks wounded men to hospitals elsewhere. Guadalcanal's hospital was on another island several hundred miles away, according to Admiral Ross T. McIntire, the Navy's surgeon general, who also revealed:

"Hospital planes are taking off at regular intervals from the battle zones. The network of flying ambulances embraces an area 2,000 miles in diameter in the battle areas of the Pacific."

Surgeon General James Magee of the army reveals that on occasion seriously ill—not wounded—men are flown from distant places back to the United States by a series of airplane hops, without stopping at hospitals en route. Several were flown from Karachi, India, a distance of about 15,000 miles.

In the jungle, whole portable hospitals may be carried to within half a mile of the front. From these, patients are generally carried on litters to the clearing stations. The hospital may look as rough as the country—but it's safe to say the treatment equals or surpasses that to be obtained at the most expensive clinics at home.

By the end of 1943, an estimated 53,000 doctors will be serving with the armed forces. This will compare with about 70,000 left at home. The figures mean civilians will have to learn to avoid imposing on doctors for trivial ills, and will have to expect some delays. That is a sacrifice civilians can make for victory—not to be compared with a soldier's possible sacrifice of his very life.

And wherever the battleground, the doctors in American khaki will still be saving soldiers' lives with the best medical care in the world.

Flexible Stretcher Serves As Sling or Litter



Straps hold patient when litter is used as a sling

Designed especially for use where rigid stretchers are inadequate, a flexible stretcher, made of heavy cotton cloth, has rope sides through which poles may be threaded for rigidity if desired. Equipped with a headpiece of metal tubing and a plywood footrest, the stretcher readily folds into a compact bundle. Straps hold the patient firmly, and the unit may be used as a sling.

with carpet co.
205 5th Ave.
N. Y., N. Y.

Jeep Pulls a 25-Seat Trailer Made of Lumber and Pipe

71262



With only salvaged materials, men at a Florida air field have solved their transportation problem by constructing a personnel trailer capable of carrying 25 persons. It has automobile wheels, and the remainder of the body is made of wood and pipe. It is mainly used to transport visitors who come to the gate without their own cars. Motive power is a jeep.

Low-Fuel, Fla.

W.R. W. Grant 7/85

TRY THIS ... They SAY it's EASY



Water skiing, newest aquatic sport, has few equals for spine-tingling thrills. Above, skier sails through air after taking jump while companion rides alongside. Skier grasps wooden handle of 100-foot tow line



Chuck Sligh of Holland, Mich., national water ski champion, grabs bite of lunch and reads paper as he rides six-inch "jitterboard"



Above, riding on one ski, the champion hangs onto tow rope with free foot while holding other ski in hands over head

Skier at left nearing water as he completes a 45-foot jump. Falls are seldom serious for rubber shoe laces release skis

Right, while one skier takes jump, the other performs all the zigzag turns and tricks of Alpine expert. Speed of tow boat is about 40 m.p.h.

Below, bending backward, his hands gripping wooden handle of the 100-foot tow line, Champion Sligh shows the correct form for a jump



Clearing five-foot jump ramp (right) takes skill and perfect balance. The ramp is 24 feet long with one end in water—skiers hit ramp at 30 m.p.h.



Quartet (below) performs a stunt not recommended for beginners. Man in the lead rides aquaplane while two on skis hold bar on which fourth man does turn



Twenty-Five-Ton Carving Hewn From One Log



Model shows relative size of mammoth, 25-ton statue

Paul Bunyan, mythical woodsman whose prodigious feats have been the topic of logging-camp yarn spinners for generations, and his equally fantastic blue ox, Babe, are the subjects of the world's biggest wood carving, a 25-ton effort fashioned from an 18-foot Sequoia log. Work by the sculptor, Carroll Barnes of Three Rivers, Calif., was uncompleted when he was inducted into the Army, but he intends to finish it when the war ends.

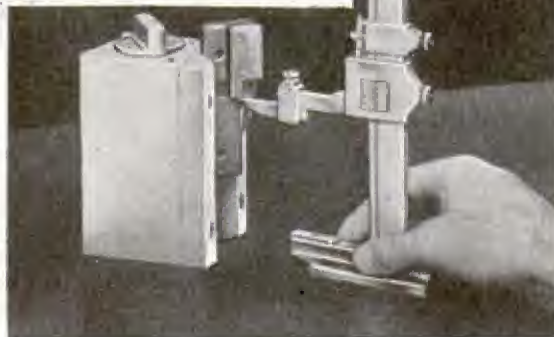
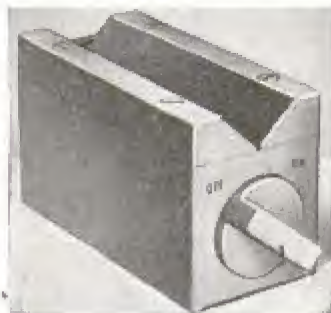
Opaque Glass-Wall Radiators Slated for Post-War Homes

Homes of the future may have sliding glass partitions that can be made opaque or transparent at will, and that may be fitted with artistic metallized decorations through which electricity would pass to heat the room, according to Dr. Alexander Silverman of the University of Pittsburgh. By sandwiching light-polarizing material in glass, then crossing two plates in a dou-

ble-wall construction, an opaque partition would result. When one of the plates slides back, the partition becomes transparent, permitting light to stream in. As to the "radiators" in the walls, Dr. Silverman contends that a room at 60 degrees, insuring uniform radiation toward the body from all sides, would be more comfortable than today's home at 70 degrees or higher. Almost all reflected light glare from such a glass interior could be eliminated by the recently developed treatment of sheet glass to produce thin etched films only about a molecule thick.

Magnetic Grip Holds Work In V-Shaped Jaws

Designed to hold iron or steel work of round or rectangular cross-section, and also irregularly shaped pieces, a magnetic block, operated without wires and said not to heat in operation, has V-shaped jaws. When the control switch is turned on, work is held in the V, and if the block rests on a magnetically conductive surface, the block and work both will adhere to that surface. The switch control directs the "pull" of the magnet. When it is turned on, magnetic flux passes through the V and through the work held in the V, as well as passing through the base of the block, thus making it adhere to the conductive surface on which it rests. When the control is in off position, the flux completes its circuit within the block, and the work and block itself are accordingly free. Holding power of the magnet can be regulated by giving the control only a part turn.



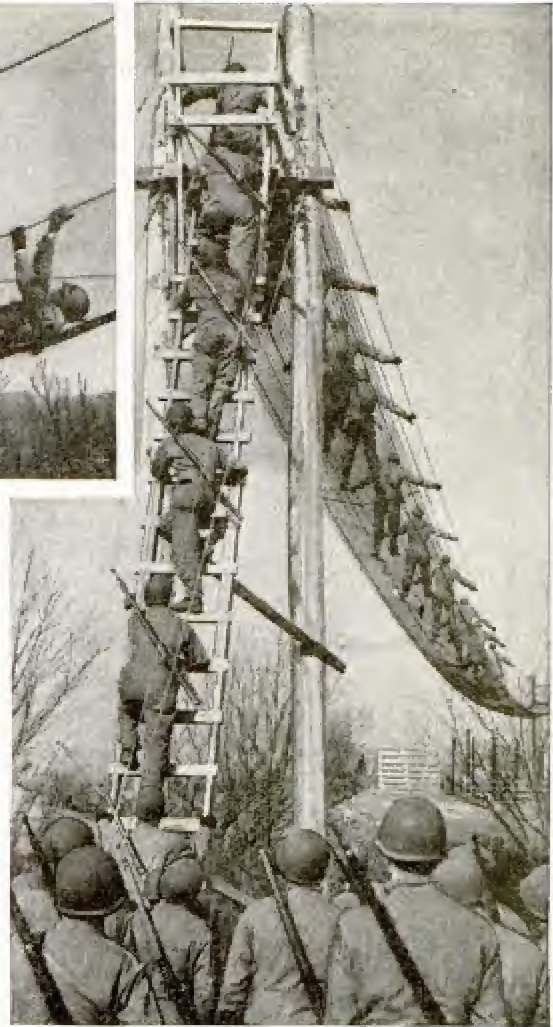
Gauging work in magnetic block, also shown in inset

Wire Crawl and Dizziness Test Harden Seabees



Heavily burdened Seabees practice wire crawl, above; right, walking wire-mesh bridge over rugged terrain

Navy construction battalions, the renowned Seabees, are given a toughening course similar to that provided Army shock troops at an eastern naval station. Burdened with their rifles and combat helmets, the Seabees are required to perform an acrobatic wire-crawl in one phase of the training, which prepares them for emergency crossing of a stream or similar difficult terrain. In another test, the men walk a swinging wire-mesh bridge, strung 30 feet above the ground. Besides acquainting them with an emergency method of bridging otherwise impassable ground, the swinging bridge tests their reaction to heights, because the mesh of the bridge permits them to see the ground below.



Auxiliary Fire-Fighting Truck Is Converted Delivery Car

Fleets of self-sufficient fire trucks stand ready to whisk San Francisco's auxiliary

firemen to the scene of a blaze in the event of an enemy air raid. Many of the trucks are of a type familiar as retail delivery cars, maneuverable in traffic, with sliding doors to assure easy access and curb-height floors and low bodies to make removal of equipment easy. Air-cooled engines eliminate the danger of freezing. Equipment includes a pump capable of pumping 500 gallons a minute at 120 pounds pressure; 500 feet of 2½-inch hose, a 22-foot extension ladder and a 14-foot roof ladder, and two 12-foot hoses of 4-inch diameter with which the pump could suck water from a main, a cistern, a swimming pool, or from the bay.



Truck type familiar as a delivery car carries auxiliary firemen's equipment

By: Wm. Thomas G. Higgins, Jr.
3822 7th Avenue
San Francisco, Calif.

7/17/



Current war movies contain up to 75 percent actual combat scenes, though this was filmed on the lot

THE MOVIE director and his friend had finished the preview of a new war picture.

"It's wonderful what you people can do," the friend exclaimed. "That naval battle was remarkable. I suppose it was done with tricks and miniatures, but it was mighty impressive."

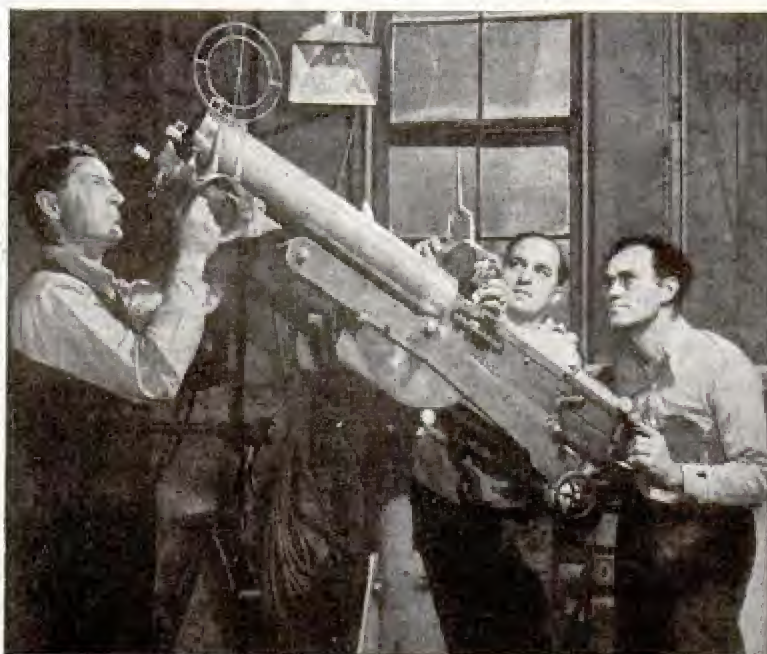
"Tricks! Miniatures!" the director retorted. "Man, I'll have you know that we almost lost our lives getting that scene. Those airplanes overhead were real Germans and those bombs were the real thing. We've stopped filming make-believe battles."

The director was not entirely correct because technical excellence often demands that a battle, or parts of it, be fought in make-believe for screen purposes. But some of the war pictures being made today run upwards of 75 percent of footage made in combat. Practically all of the current war pictures contain material filmed during battle.

For "Corvettes in Action," Universal put a

camera crew on a Canadian corvette in the North Atlantic, which was credited with sinking four U-boats while they were aboard. Jim Havens of Twentieth Century-Fox was on a warship outside Pearl Harbor the "day of infamy," and scenes he recorded that morning appeared in "To the Shores of Tripoli."

For its corvette picture, Universal brought back 70,000 feet of film, showing torpedo tracks in the water, German bomb-



Antiaircraft machine gun at Universal made of wood and scrap

ers plunging into the sea, rescues of oil-smeared seamen, and depth charge explosions—a sight movie technicians can't duplicate because there is a certain preliminary sparkle in the water, followed by miniature geysers, that precedes the upward rush of water from a real depth charge blast.

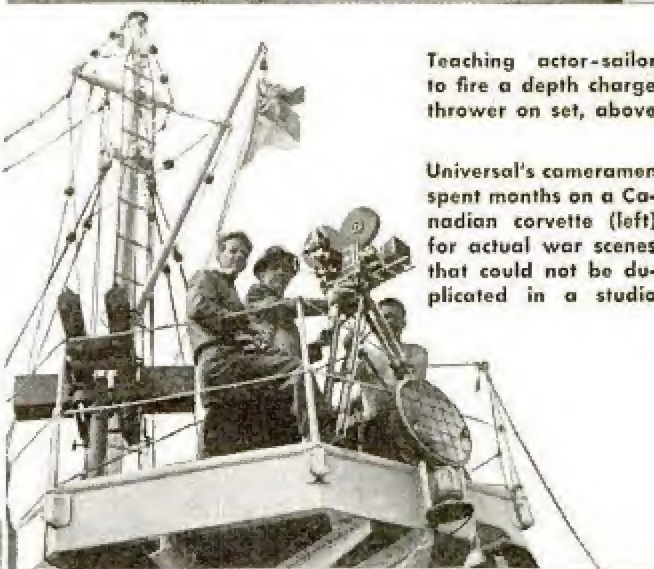
However, though there may be room on a corvette for a camera crew in war, there's no room for actors, and a film story needs actors to carry along the plot. So John Goodman, Universal's art director, created true-to-life duplicates in Hollywood of parts of the corvette. He built them up from hundreds of photographs, scaling measurements off from the pictures and then laying out the plans on drafting boards. In some cases these drawings were enlarged full size by photography and then used as patterns for building the sets. A corvette's bridge, asdic house, deck, stern, and engineroom were built at the studio. A five-inch naval gun and .50-caliber machine guns were created out of wood and metal scrap. They don't shoot real shells but they smoke and spit flames, then recoil like real weapons.

These days, a sailor or soldier at a training camp is likely to see

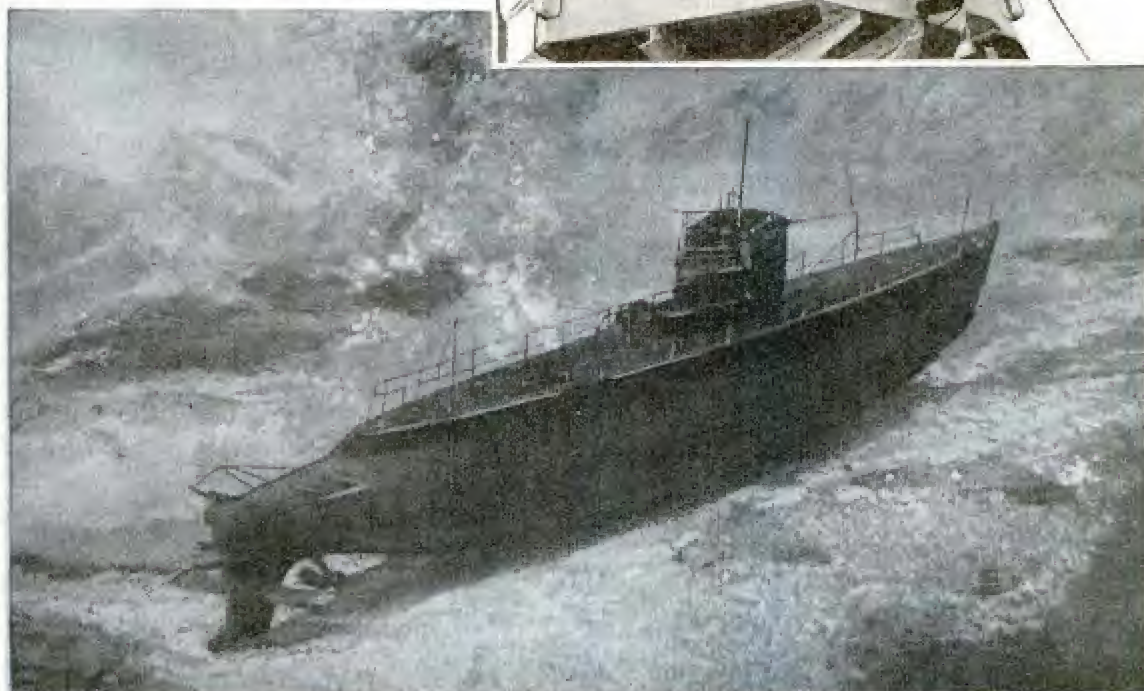
For "Crash Dive," 20th Century-Fox used a movie sub in vivid underwater scene below



Teaching actor-sailor to fire a depth charge thrower on set, above



Universal's cameramen spent months on a Canadian corvette (left) for actual war scenes that could not be duplicated in a studio





Universal used full-scale plans to make its studio depth-charge thrower

a movie camera crew in action, making films of things that are normally taboo to photographers. But there is an officer with the camera, picking out angles that won't reveal secret gear, and besides, the film will be censored before release. Most branches of the service allow studios to film action and background pictures to make the films more authentic, provided that there is no interference with operations or training. Thus 20th Century-Fox spent some time at a New England submarine base shooting scenes that give authenticity to "Crash Dive," and R.K.O.-Radio made visits to a southern air base for material used in "Bombardier."

Here again, some scenes were needed that were impossible to get in real life.

Bomber "at rest after a belly landing" is really undamaged and resting on its wheels in a pit. To get crackup effect for R.K.O., bent props from old wreck were installed, and dirt was heaped around its nose and nacelles

These included some shots inside a bomber. The answer was to rent Paramount's movie bomber, a full sized set including a bombardier's compartment, cockpit, bomb bay, and other quarters. Sections of the floor, roof, and sides may be removed to provide any camera angle desired, and the whole set comes apart in sections.

The set is true to life in all but a few secret details that only a bombardier would be likely to notice. Even the mock instruments show the speed, altitude, angle of climb, motor revolutions, and so forth, that are needed for the scenario.

The dials are hooked up to an offstage control board where a technician manipulates them with rheostats.

No one is going to crash a bomber, either, just to make a motion picture. Such scenes are usually made with models controlled by wires and that have "break-away" wings that collapse. Squibs in the cabin or engine nacelles can be ignited to give the effect of fire.

Sometimes a war picture is assembled from odds and ends that seem to have nothing in common. "Aerial Gunner," put together by the Pine Thomas organization, consists of parts that were fitted like a jigsaw puzzle.

After the plot for the picture was decided upon the company began to hunt for things



that would fill their needs. Some newsreel footage of actual bombing operations was snapped up, as was another newsreel, one of the last to be brought out of Japan, that showed a Zero in combat maneuvers. Some of the other scenes were made in Hollywood, and the balance at an aerial gunnery school in Texas. One shot, showing a gunner on a bomber shooting down a Zero, was achieved by making a close-up of the gunner, then double printing that film with some of the Zero newsreel material.

One of the reasons why war pictures are so popular now is because so many people have relatives in the service. True-to-life motion pictures are one way by which the folks back home can see and understand the conditions under which their men are fighting. Even those parts of films that are made in Hollywood are accurate because they have been supervised by technical experts familiar with the scenes involved. In some cases the technical experts are men who have just returned from battle.

War is causing Hollywood property men to think up substitutes for some of the materials they used to use for pictures. Instead of actually scattering a truck load of eggs over the highway when the script calls for wrecking an egg truck, the prop men call on neighboring restaurants to save their broken eggshells for a few weeks ahead of time. The broken shells are just as realistic for the picture as if the truck were loaded with fresh eggs. German sausage is off the market yet the script of "Hitler's Children" called for some. Beets, trimmed and sliced up and held together with a skin of cellophane, substituted for it.



Realistic battle scenes for 20th Century-Fox's "Immortal Sergeant." Above, movie tank moves between bomb explosions that are carefully controlled dynamite charges. Below, ground-strafting plane scene was shot on desert



Pictures Teach Mat Holds to Navy Wrestlers



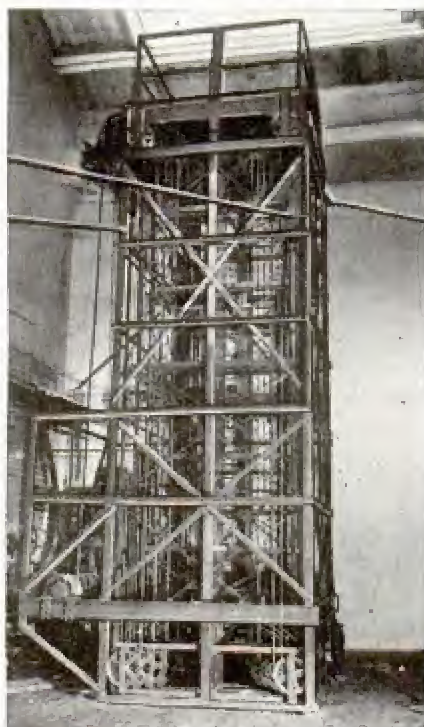
Harassed by a time limit in the teaching of varsity sports, Ray Swartz, Naval Academy wrestling coach, uses stills from movies of actual wrestling matches to show plebes at the academy the consecutive body movements from the beginning to the conclusion of a hold. Pictures are 11 by 14 inches, and are set at two levels, though both are eye-high. Pictures illustrating takedown holds, or those from standing position, are set at higher level than those illustrating holds on the mat. Upperclassmen act as tutors, using the sets of photographs to teach the sport on "mass-production" lines.

Pictures show wrestlers proper holds. Top, instructor explains grip. Bottom, pictures are at two convenient heights

Portable Elevator Can Hoist Hangar Workmen 95 Feet

Crews called in to repair the roofs of airplane or dirigible hangars may take their scaffolding right along with them, thanks to the development of a portable, electrically operated telescopic platform, highest-reaching one yet built, which rises 95 feet into the air. With a minimum height of 20 feet, the machine is mounted on a platform base 15 feet square, with outrigging supports measuring 30 feet from one side to the other. Five telescoping frames are used.

Portable hoist is used to repair hangar roofs. Left, the hoist collapsed. Right, it rises high above roof of factory where it was built



Mr. Ray Swartz, Head Coach of Wrestling
 U.S. Naval Academy, Annapolis, Md.
 Mr. Ray Swartz, Head Coach of Wrestling
 U.S. Naval Academy, Annapolis, Md.
 Economy Engineering Co.
 2643 W. Van Buren St.
 Chicago, Ill.

Glider Carries "Narrow-Gauge" Army Tractor

Airborne engineers, army shock troops whose duties might be to help seize and expand an airport to facilitate the landing of following troops, have as one piece of equipment a midget tractor, small enough to be carried in a glider. In tests at an eastern airfield, the tractor showed off its bulldozer equipment, and its other adaptations fitting it for such tasks as grading runways or hauling heavy machinery.

Among the items of midget equipment furnished army's airborne engineers is this tiny tractor, fitted with a bulldozer adaptation. It can grade runways or haul heavy war materiel



*Dr. Stone Verity
Laney, Pa.*

Seaman's Buoyant First-Aid Kit Doubles as Life Preserver



Watertight kits, buoyant enough to act as a life preserver for a man cast into the sea, are made large enough to carry medical supplies, cigarettes and compressed foods, if desired. They are slung on a rope long enough to pass over a man's shoulder if the ship is abandoned. In the water they will sustain his weight, besides providing first-aid equipment. The kits are a bright orange-yellow, to make them visible to searchers.

Watertight kit holds first-aid supplies, cigarettes, compressed food, inset. It is sufficiently buoyant to sustain weight of a man in water

*Waterlight Slide Fastener Corp.
15 Hitchcock St., N. Y. N.Y.*

Nazi Half-Track Serves British as a Troop Carrier in African War

During one of the British successes over Rommel in North Africa, Allied troops recovered a huge German Mercedes-Benz half-track, in good operating condition. With its Nazi insignia removed, the lumbering vehicle was speedily put to work hauling 8th Army forces into a new attack.

Captured Nazi half-track becomes British troop carrier



7267

Thomas G. Stinson, Jr.
387d - 17th St. & 1st Ave.
Los Angeles, California

01196



Injecting colchicine into stalk
of a young cryptostegia plant,
a potential source of rubber

from Madagascar that flourishes in frost-free latitudes. Break a small branch and immediately a globule of white latex drips from the wound. It is said that cryptostegia can produce as much rubber per acre as do the hevea rubber trees of the tropics.

What makes cryptostegia suddenly seem important is an event that occurred last winter in California's Imperial Valley. A freeze killed all the shrubs in one test patch, but none of the cryptostegia in an adjacent patch was harmed. The only difference between the two groups was that the frost-resistant plants had been treated with a chemical called colchicine. Quite prob-

Collecting latex sample from
cryptostegia branch. Notice
white fluid oozing from cut

PLANTS GROWN *to* ORDER

AGRICULTURAL science is not only racing against time to provide us with materials that we are accustomed to get from abroad; it is helping to place the continent on a self-sufficient basis so that never again will we need to depend so desperately on foreign sources for raw materials.

Rubber, of course, is our first need. Some astonishing events are taking place in this field and there is a possibility that shortly we will be able to grow all the rubber we need right at home.

At present, guayule shrubs are being widely planted and research is being conducted on other latex-bearing plants, including milkweeds, rabbit brush, dandelions, and cryptostegia. This last is a fast-growing ornamental bush



ably this new resistance to cold will carry over from generation to generation, widely extending the area in which cryptostegia may be grown commercially.

If that's the case, why can't rubber trees receive colchicine treatment to stand cold climates so that we could have our own rubber plantations, say in the Mississippi Valley? That's a reasonable possibility.

Plant scientists are learning they can do all sorts of odd things to plants by exposing them to new treatments. They can reverse the seasons and make summer-blooming plants go to sleep in the spring, to reawaken in the fall and bloom during the winter. They can create an artificial winter by applying ice near the roots of a plant. They can grow heavily rooted plants entirely in air instead of keeping the roots in soil or water. The roots dangle downward in a dark room in an atmosphere that is saturated with water vapor, a practice that permits close inspection

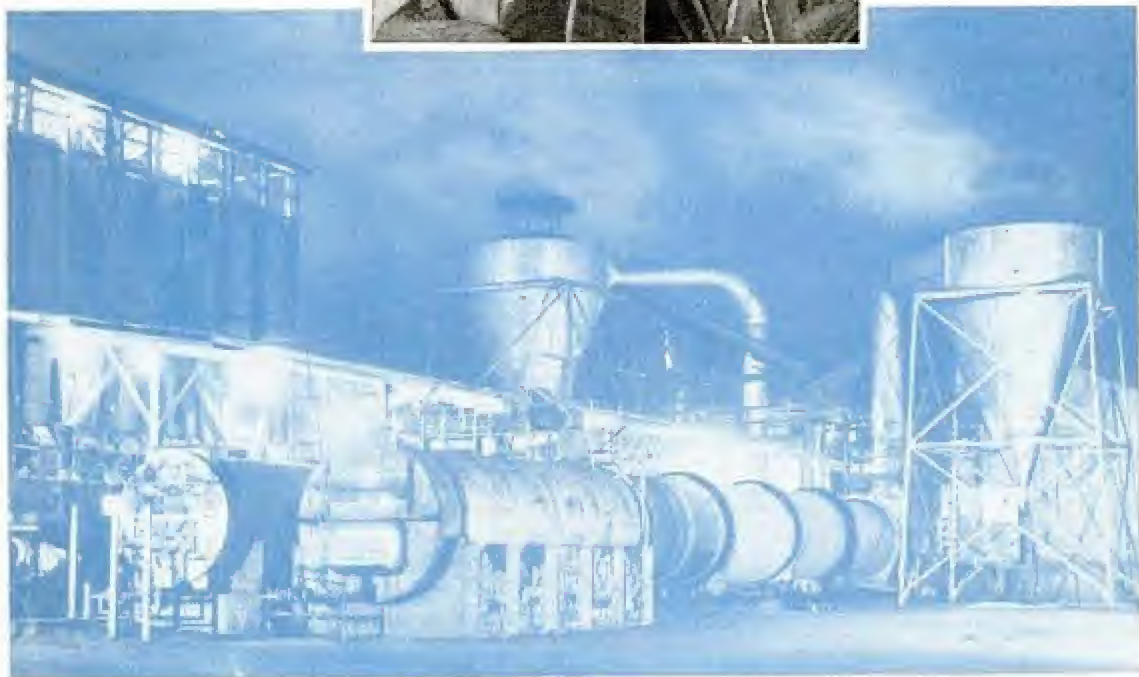


Above, cultivating young cryptostegia plants. This tropical bush transplanted to California and given a colchicine treatment, survived a freeze



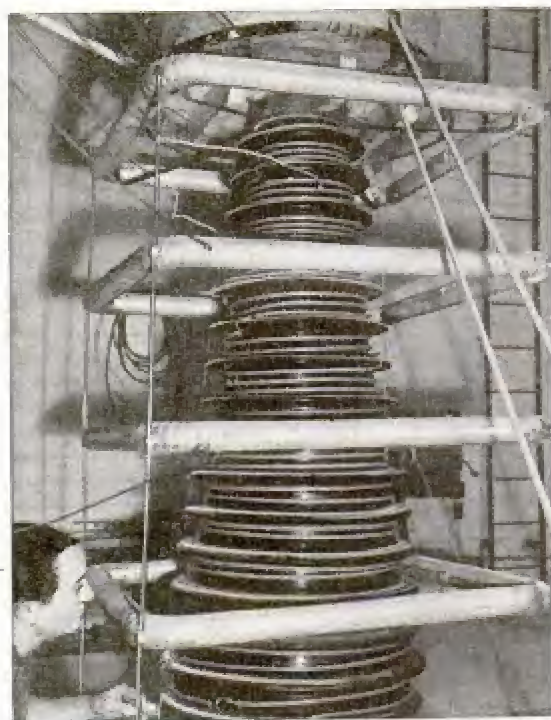
Painting colchicine paste on the stalk of a banana tree in an experiment attempting to increase its resistance to cold, as was done with cryptostegia

Orange pulp left after removal of juice, pectin and other byproducts is dried in the rotary kilns below, then sacked and sold as livestock feed





Above, inspecting orange juice as it flows over illuminated glass plate. Vacuum pipes held by the inspectors collect bits of pulp and seed seen in juice



clude the application of Vitamin B₁ which stimulates root growth, resulting in rapidly growing plants. Other plant hormones are used for similar results, in some cases increasing crop yields by as much as 50 percent. Indole-acetic acid is a root stimulant that works miracles in transplanting or in propagating from cuttings. A patent has been issued covering the use of a phyto-hormone such as phenylstearic acid that causes fast rooting in cuttings from such trees as poplars.

Right now the most promising of the different chemical treatments seems to be with colchicine.

This poisonous powder is extracted from the roots of the autumn crocus and induces genetic changes in plants or seeds that are treated with it. Its most frequent effect is gigantism, producing giant flowers, tall growths, and wide leaves. It may make plants more drought-resistant or cause them to bear earlier. All such characteristics seem to be inherited from then on. Seeds are soaked in a colchicine solution for from half an hour to several days in experimental plantings, or the colchicine is mixed into a glycerin solution and is sprayed on the growing plants. In another application it is mixed with a grease and applied to stalks and branches. It is a deadly poison and must be handled carefully.

You can't predict what the effects will be when you treat seeds or plants with colchicine or when you combine colchicine and other chemicals and apply them to plants. In one experiment in which the treatment was mainly with plant hormones, *cryptostegia* seedlings were grown to a height of nine feet in three months. These

(Continued to page 156)

Left, upper end of giant vacuum tube used in radiation bombardment experiments. Below, test plantings of cyclamen: plant at right had normal diet; center, Vitamin B₁; left, Vitamin B₁ plus other stimulants

of the roots for studies of root diseases.

Seeds have been bombarded with X-rays and other radiations to alter their heredity-bearing chromosomes and thus change the course of evolution. Only a fraction of the seed that is treated this way is affected but the new flower shapes that result seem to reproduce indefinitely.

Chemical treatments in-



Movies Give Illusion of Actual Flight in Trainer

Student pilots may be given realistic flight training indoors, and in any kind of weather, with the Soule-Rabkin preflight trainer, which utilizes a moving picture strip, on which the outline of the plane's nose is silhouetted, so that the student may actually see what the position of the plane would be as he goes through the various flight maneuvers. The illusion of actual flight is heightened by the noise of a motor, that increases in intensity as the throttle is opened.

Instruments on a panel in front of the pilot show the true record of the maneuver, and the cockpit is equipped with a "mistake counter," an automatic record of the errors the student makes during his "flight." The counter, however, by means of a timer relay gives the student three seconds to rectify any mistake made before the error is recorded. The revolving scenic strip is interchangeable, and by this means, makers say, any pilot may be familiarized in advance with a particular terrain. The nose silhouettes also are interchangeable, so that the student may be familiarized with the nose appearance of combat planes, as well as trainers. In ex-



Picture strip with a plane's nose silhouetted, top, shows student craft's reaction to controls. Left, a student in cockpit

ecuting a turn, the scenic strip moves across the screen in front of the student, at a speed in proportion to the steepness of the turn, and when the controls are manipulated to return the plane to even keel the scenic strip stops.

Wallpaper Comes Ready Pasted and Machine Trimmed *11-276*

Brushes, paste, roller and tables—traditional paperhanging tools—are eliminated with a wallpaper coated with an adhesive base. The paper is machine trimmed and

all the householder has to do is cut it to fit the walls, submerge each strip in a tub of water and then stick it on the wall. It takes about 20 minutes to dry which allows plenty of time for sliding the paper around to match patterns. The even application of the paste is said to eliminate danger of lumps, wrinkling and discolored spots. The only tools required are scissors, tub or sink, ruler, soft sponge, and a long string tied to a weight. The ready-pasted wallpaper is available in 24 different patterns with borders and ceilings.

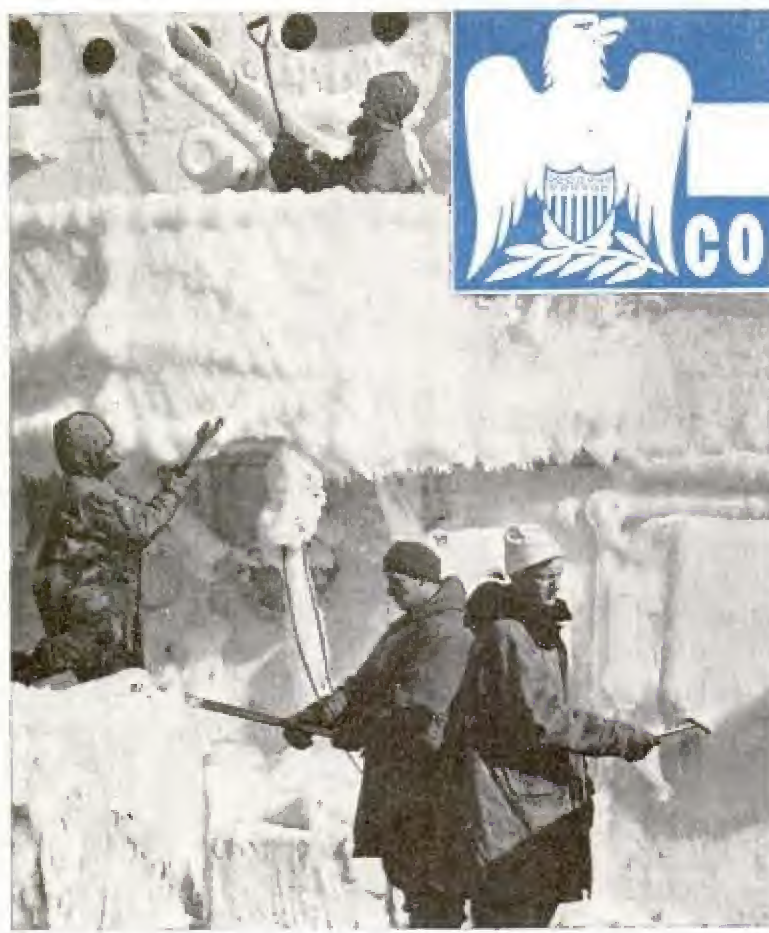


Left, immersing strip of wallpaper in tub to wet the adhesive on back. Right, unrolling moistened paper on the wall and sliding it into place

More than 624,000 pounds of metal were recovered in one year from ashes removed from the boiler pits at a General Electric plant.



HEROES of the COAST GUARD



U. S. Navy photo
Mallets, hammers, wrenches—anything that will chip ice is put to work "deicing" a U. S. Coast Guard cutter on the North Atlantic patrol. Below, loading depth charges aboard a Coast Guard ship assigned to convoy duty



THE Japanese Zero, blazing like a comet, plunged into the sea. A bedraggled little Nip aviator was seen to wriggle out of the cockpit and jump free of the fire.

"Hate to save that rat," said the American officer to the Coast Guardsman in the crash boat, "but I guess we'll have to."

And then added: "Maybe Intelligence can sweat something out of him."

"Aye, aye, sir!" replied the Coast Guardsman and swung his rescue boat in the direction of the Japanese plane, which by now had almost sunk.

The American crash boat drew alongside the Japanese flier and the officer bent down to pull the struggling figure aboard. As he reached to do so, the Jap suddenly jerked a gun from under his lifejacket, shoved it into the American's face and pulled the trigger.

By the grace of God, and plenty of sea water, there was only a dull metallic click.

The Jap then put the revolver to his own brain and pulled the trigger twice in rapid succession, but each time there was no shot. Still attempting to avoid capture, he dove for the swirling propellers. The Coast Guard coxswain speared him with a boat hook and dragged him aboard. As he continued to fight, the Coast Guardsman banged the ungrateful son of Tojo over the head with a five-gallon gasoline can while

Public Relations - U. S. Coast Guard, Washington, D. C.



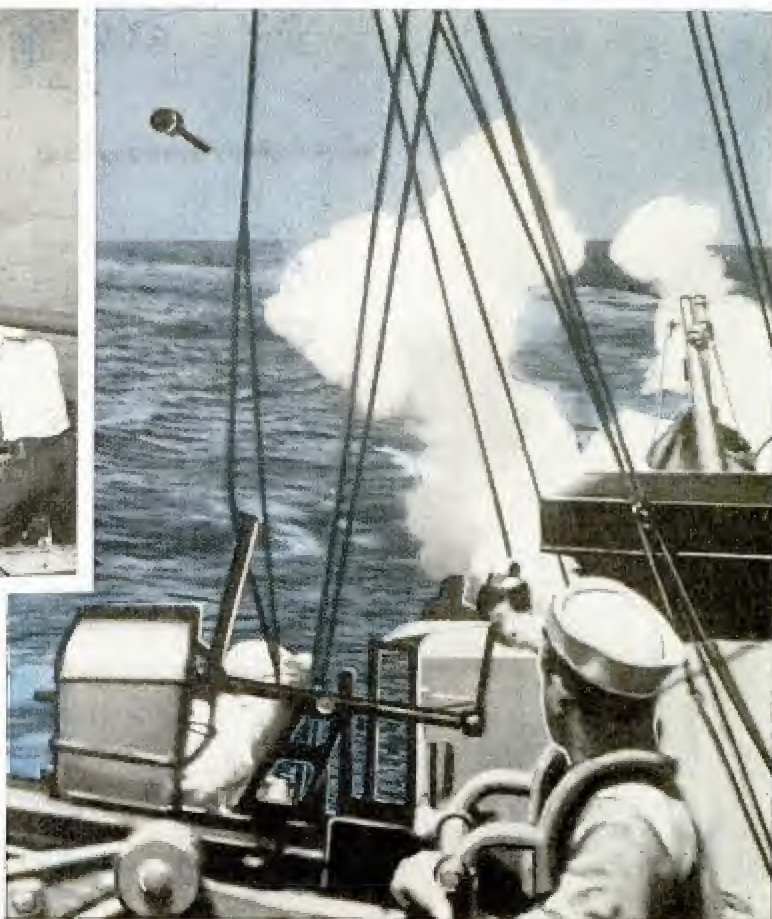
the officer clipped him on the jaw.

This happened at Guadalcanal—and is only one of the many incidents which prove that the "Coast" Guard no longer bears a descriptive name.

Many are apt to think of the Coast Guard as some sort of seagoing "home guard." Nothing could be farther from the truth. Since Japan attacked the United States in December, 1941, the Coast Guard has seen action in Guadalcanal, the South Pacific, New Guinea, Australia, Alaska, Panama, the Caribbean, the North Atlantic, Africa and Greenland.

The Coast Guard not only carries on its peacetime duties—such as enforcing navigation laws, promoting the safety of continental waters, keeping check on icebergs, protecting public property, supervising the anchorage and movement of munition ships, and removing derelicts and other obstacles to navigation—but gets right in where the fighting is roughest.

This has been true throughout its long and valiant history. The Coast Guard has fought side by side with the



Top, left, manning depth charges and gun on a sub-buster of the U. S. Coast Guard. Above, a "potato masher" depth charge is flung out in a cloud of smoke from one of the Navy's PC boats, to wreck or blast to the surface any nearby submarine. Below, feeding a gun on Coast Guard cutter



Jamaica Plain, Mass.



Seaman on yacht converted for patrol sights unidentified boat

Navy in almost every war in which the United States has engaged. Man for man, the Coast Guard was the "fightin'est" branch of Uncle Sam's armed forces in World War I. It lost a larger percentage of men than did the Army, Navy or Marines.

Pearl Harbor found the Coast Guard ready. On November 1, 1941, it had been transferred from the Treasury Department (under which it operates in peacetime) to the Navy Department. At that time it had a total of 24,000 officers and men, 5,000 civilian employees and nearly 300 vessels of all types.



Other ships were under construction and planes were on order. Since then the Coast Guard has grown rapidly in size and strength. But it was this small, well-knit nucleus, and the skills and traditions developed in peacetime, that gave it the fighting sock it possesses today.

One of the Coast Guard's most important jobs always has been to protect docks, factories and warehouses from fire and sabotage. It was entirely fitting, therefore, that a Coast Guardsman, John C. Cul-



Coast guardsmen man a variety of converted ships (above) scouting off the coasts. At left, a depth charge bursts astern of an antisubmarine Coast Guard patrol ship

len, seaman, second class, discovered the eight Nazi saboteurs who landed on a Long Island beach last summer. A typical Coast Guardsman who kept his wits about him, Cullen gave the tip that resulted in the capture and eventual execution of the German saboteurs. Without a doubt, he saved the lives of hundreds of American workers and property totaling millions of dollars.

In the Solomons, the Coast Guard played a vital role in carrying men and supplies from transports to the beach. In the early days of the fighting, when the issue was often in doubt, the Coast Guardsmen pitched in to help the Marines.

Some manned their own machine guns on beach heads, others helped the Leathernecks operate 5-inch field pieces, and still others grabbed their rifles and charged with the Marine Corps infantry.

"The job at hand was to shoot the Japs," according to Warrant Officer James D. Fox, of Uniontown, Pa., one of the Coast Guardsmen who saw action with the Marines. "The Guardsmen proved they were as qualified for that job as they were for landing boats on the beach."

Another Coast Guardsman who found adventure at Guadalcanal was Chief Boatswain's Mate Vernon A. Suydam, of Sayville, Long Island, N. Y. He was one of the 12 Coast Guardsmen assigned to handle small boats aboard the Navy destroyer, Little.

"I was at my gun post," he says, "when two Jap cruisers and three Jap destroyers started shooting at us. They let loose with everything they had—blasting our stern gear and bridge and knocking out our controls so that the Little was making crazy circles in the water.

"When the order to abandon ship came, I hitched up my life jacket and jumped overboard. There were seven of us in a



U. S. Coast Guard photo

Both sailing ship and airplane help keep the sea lanes safe for freight

group. A Jap cruiser came by and strafed us, wounding all but me and another.

"I took a wounded officer in tow and started swimming, keeping my direction by the stars."

Suydam swam for six long hours before he discovered that the officer he'd been towing was dead.

"It was dawn by this time," he said, "I could see land ahead but it was a long way off. Twice during the day American planes flew overhead but they didn't spot me."

All that day and well into the next night, Suydam managed to keep afloat. Finally, 23 hours after he

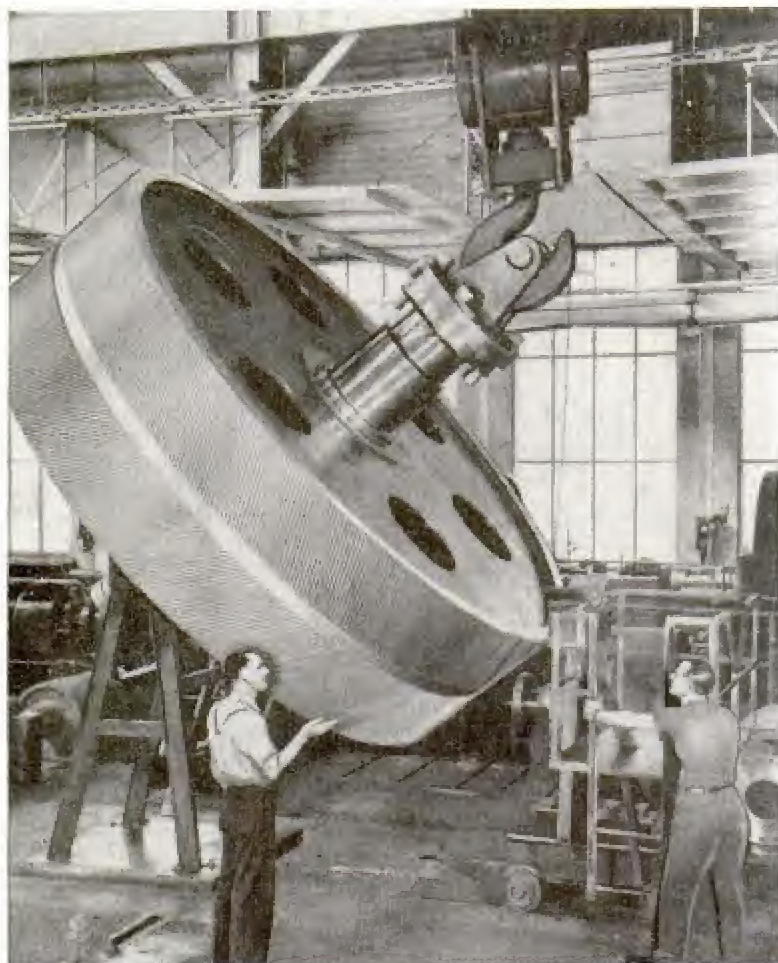
(Continued to page 152)



An ice-clad 83-foot patrol boat manned by reserve cadets of U. S. Coast Guard academy nears port to get supplies and ammunition

Cont: Major Julian D. Lippert
2200 7th St. S.W.
Oakland, Calif., Ohio.

Giant Hook Holds Huge Gear As It Changes Position



Mammoth low-speed gear is turned from vertical to horizontal by workmen

Gears so huge that they dwarf the machinery making them, yet with rigid tolerances and delicately machined surfaces, are an essential part of the nation's construction for wartime. In one plant a mammoth low-speed gear had to be turned from vertical to horizontal for completion of work. A conveyor with its hook capable of multi-ton loads held the gear while other special equipment gently swung it to its new position.

Severed Nerves Mended With Frozen Fragments

Fragments of nerves may be stored for future use as grafts, much as blood plasma is stored, Dr. Paul Weiss of Chicago declares. Frozen at 150 degrees below zero, Centigrade, dehydrated

in a high vacuum, sealed and stored in dry condition, they last indefinitely without losing their effectiveness as grafts. They are rehydrated before use. When grafted, such nerves are readily pervaded by regenerating nerve fibers, much as if they were living. With another aid to the neurosurgeon, sleeves of fresh or frozen-dried arteries, nerve stumps can be spliced without being sewed together. With this method, practically ideal nerve regeneration has been obtained, Dr. Weiss reports.

Aircraft Factory's 'Centipede' Is a Wire Harness

Resembling a giant thousand-legged bug, the ignition harness which simplifies the routing of current to the 36 spark plugs of a Pratt and Whitney Aircraft Double Wasp engine is a time-saver in the field. Besides giving protection to the 2,000-horsepower motor's ignition system, it also makes the system more accessible for repair.



Multi-legged "insect" is ignition harness for aircraft engine

N 302
United Aircraft
Corp. Hartford, Conn.

7/263

U. S. Army Air Force photo



been bobbed until they measure 6 feet. The body is lightly constructed of wood frames and battens and covered with doped fabric. At speeds above 20 miles an hour the wings give a noticeable lift that raises the pontoons from the water, thus decreasing friction and water resistance and increasing speed. Standing still, the craft requires a depth of about 12 inches, but at full throttle, only 8 inches. It carries a crew of three and can transport an additional 1,500 pounds, which can include first-aid, raft and other rescue equipment.

W302

Masked mechanics will "keep 'em flying" should the enemy resort to gas

AUGUST, 1943

es. Masked mechanics will "keep 'em flying" should the enemy resort to gas.
 3 Sgt. G. J. O'Connell, Corp. Wm. L. Latta / 1st Sgt. J. J. O'Connell. 65
 Waco, Texas / Omaha, Nebraska / Flight Chief,
 Port Arthur, Texas

65

Mr. Frederick Strat.

7/194

"YOU CAN DO IT BETTER



Sealing a radio transmitting tube with a gas "flame thrower" in Westinghouse plant. Below, tapping a tank in synthetic rubber factory; natural gas is converted into butadiene
OWI photo



By Dr. Gustav Egloff

Director of Research
Universal Oil Products Company

910 S. Michigan, Chicago, Ill.
N**NATURAL GAS** is one of those rich resources America has come to take for granted. You never see it, so you forget about it until a bill for cooking or heating gas comes along from the utilities company with the reminder: "You can do it better with gas."

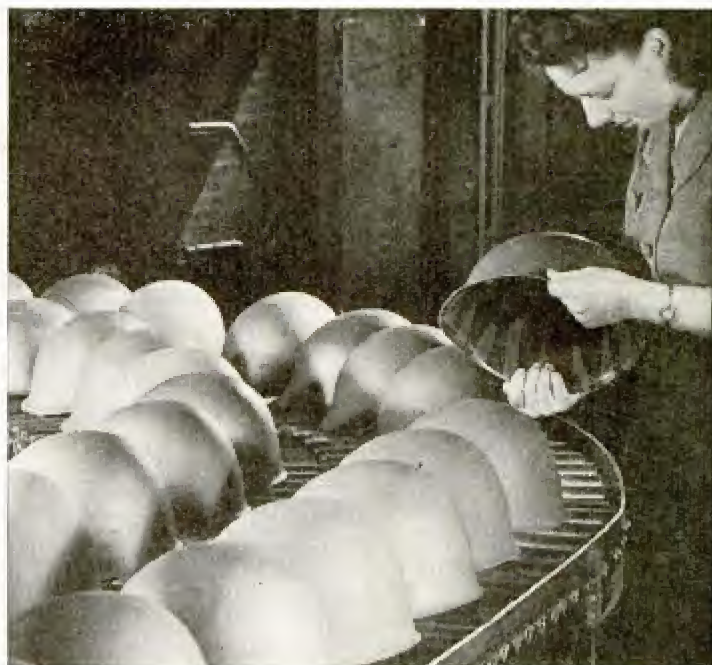
When they say that, they are taking in a lot of new ground. For years natural gas was used mainly for heating and generation of steam and electrical power. But in recent years research has put gas to work in a much wider field than mere fuel. Its hydrocarbons now are converted into superior aviation gasolines, lubricants, synthetic rubber, explosives, acetylene, anaesthetics, plant life promoters, plastics, solvents and many other chemical derivatives.

Natural gas is consumed at the rate of over 2.6 trillion cubic feet per year. The United States has proven reserves of 85 trillion cubic feet and another 85 trillion as potential reserves. Yearly consump-

with GAS"

tion of natural gas is equivalent in fuel value to 100,000,000 tons of coal or over 500,000,000 barrels of fuel oil.

In the Axis countries, methane gas is a widely used substitute motor fuel. There are over 107,000 compressed gas (methane, ethane, propane, butanes) propelled motor vehicles operating in continental Europe, which conserved about 2,300,000 barrels of gasoline for military use. Compressed gas is sold at filling stations exactly as gasoline is sold here; it is under pressures up to 5,000 pounds per square inch in steel cylinders that are attached to the running board or under the floor of the vehicle. Italy has been operating many buses and trucks and even a number of loco-

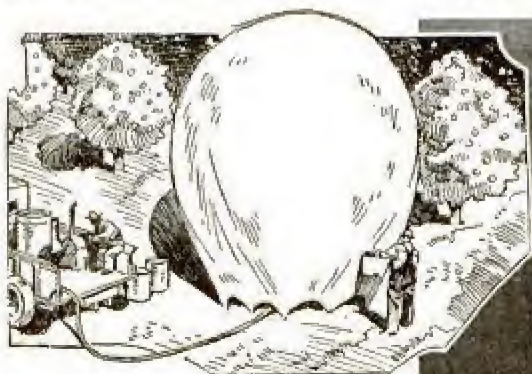


Glady's Solomon

Westinghouse photo

Organic chemists turn gas from the earth into a variety of plastics. These tough plastic liners fit inside Yankees' steel helmets

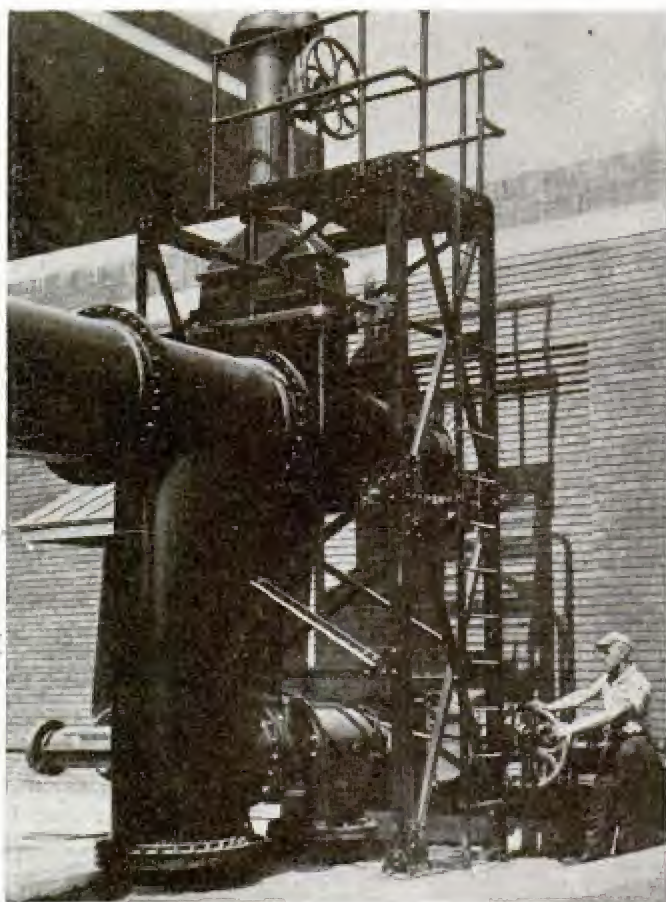
Fruit ripening is hastened by feeding gas into tent enveloping the tree (left). Below, a gas well goes on a rampage, out of control



motives on methane gas; this looks like a desperate measure, since it requires on the average about 135 pounds of steel alloy for each cylinder.

The products of fermentation of sewage are also used as a source of methane gas in Germany, and methane from coal gas runs motor vehicles in many European cities. Many coal hydrogenation units produce gasoline as well as gases. In the United States, too, there are more than 25,000 buses, trucks, tractors and power shovels burning compressed propane and butane. One truck company has liquefied butane functioning in a





The wheel is the mixing valve at end of the natural-gas pipe line from Texas to Chicago, where manufactured gas is added

dual role as a refrigerant for fruits and meats and as motor fuel for the truck after the cooling has taken place.

Hydrocarbons present in natural gas are methane, ethane, propane, butanes, pentanes, hexanes and heptanes; the first four are gases, the rest are liquids useful as gasoline.

Propane, which is readily available and has a high octane value, has been suggested as a fuel for breaking in aviation engines on the "test block," thus saving the 100-octane liquid fuels for fighter, bomber and cargo planes. Other uses for propane which have gained wide commercial application are as refrigerants and solvents in refining lubricating oils.

Isobutane and isopentane from natural gas are

Shining up the noses of "Boston" bombers at Douglas Aircraft factory. These transparent plastics can be made from natural gas

important in the production of aviation gasoline. Normal butane is converted into butadiene—a principal base of synthetic rubber—in one or two stages by catalytic means at high temperature.

From a motor fuel standpoint, hexane and heptane are practically worthless. Heptane has a zero octane rating, hexane about 25. But by changing their molecular structure the chemist can convert them into benzene and toluene, vital elements in high explosives. And one of the end-products of benzene is used in the synthetic rubber, Buna-S.

More than 100,000 barrels a day of normal butane are available from natural gas. If this were used just for butadiene, it would satisfy the entire butadiene requirements of our present synthetic rubber program.

Thiokol is another type of synthetic rubber, and one of its constituents is obtainable from the hydrogen sulfide in natural gas.

Under high temperature conditions, natural gas or its products yield acetylene, which is used to produce the synthetic rubber, neoprene, and is also the base material for nylon. Hitherto, acetylene has been produced by the

action of water on calcium carbide, the latter a product of lime and coal in electric furnaces requiring high power. Now natural-gas plants are being installed to produce acetylene at lower cost.

Germany uses a four-stage chemical process to translate acetylene made from



calcium carbide into butadiene. Neoprene rubber is made from acetylene treated with hydrochloric acid.

The world's natural rubber production for 1941 was about 1,675,000 long tons, of which the United States imported over 800,000. The United Nations have lost over 95 percent of the world's natural rubber sources, and Russia lost two of its synthetic rubber plants in the Ukraine.

Rubber is required in ever increasing quantities by both the fighting forces and necessary civilian users. A medium sized tank requires 500 pounds of rubber, small pontoon bridges 1,000 pounds, the gasoline tank alone of a Flying Fortress requires 500 pounds of bullet-sealing rubber while a large bomber uses 1,250 pounds; gas masks take .75 pound, and battleships 75,000 to 150,000 pounds. Hundreds of vital products need rubber—blimps, barrage balloons, rubber boats, rafts, life vests, hospitals, etc. It may well be that even the 1,106,000 tons of synthetic rubber per year recommended by the Baruch committee will be too low for United Nations' requirements.

Is the synthetic rubber product equal to the natural? In general, it is at least equivalent. It is su-

(Continued to page 146)



Miles of pipe lines at a Standard Oil of New Jersey refinery. Crude oils and natural gases are essential in the production of our super-aviation fuels. Below, an overland pipe line carrying natural gas takes to a suspension bridge to cross a river



*Hilda Finley
Chilliwack, B.C.*

N 190

Canada Charts Craft Offshore by Models on Map



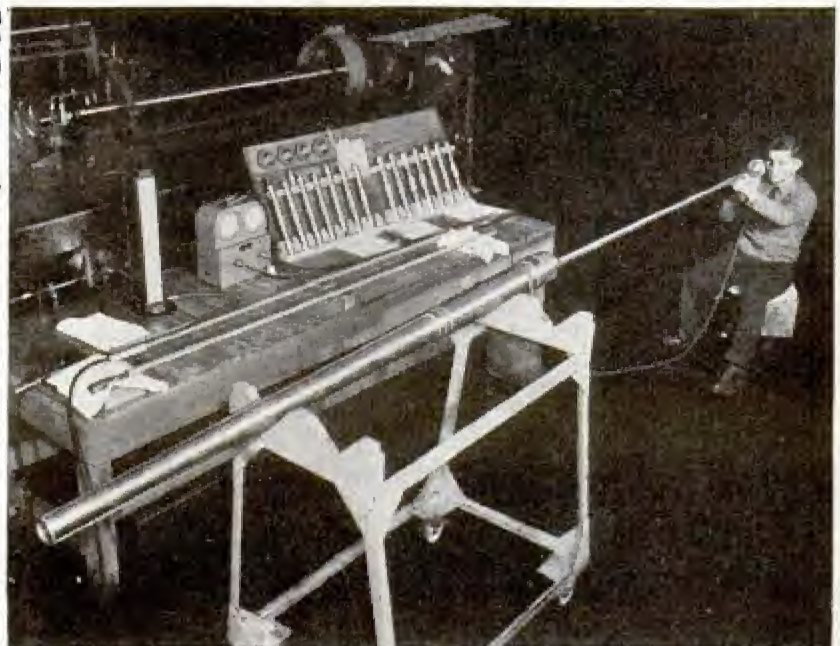
From reports received hourly, day and night, movement of all craft off Canada's coasts is recorded and mapped on a huge wall chart, to assure that none but friends or allies approach the dominion undetected. Telephoned reports make it possible for the charting crew to ascertain the whereabouts of any craft at any given moment, and also to chart its progress through the zone of operations. A glance at the wall map makes it immediately apparent what craft are where, since the charting is done by means of pin-up models that are impaled on lined-off sections of the big map, and moved as the vessel itself moves.

Hostile craft cannot expect to approach a Canadian coast point without detection. A wall chart plots the course of all craft in the zone of operation

Inspectors Peer Into Gun Barrels With Optical 'Borescope'

With a technique whose principles were borrowed from the medical profession, Pontiac inspectors examine every inch of the barrels of 40-millimeter guns for material or machining defects with a "borescope," an optical gauge that permits the inspector to view the barrel's interior under a strong light. Such examinations once were attempted by feeler gauges.

Doormats of wooden links are offered as a substitute for those formerly made of rubber or steel.



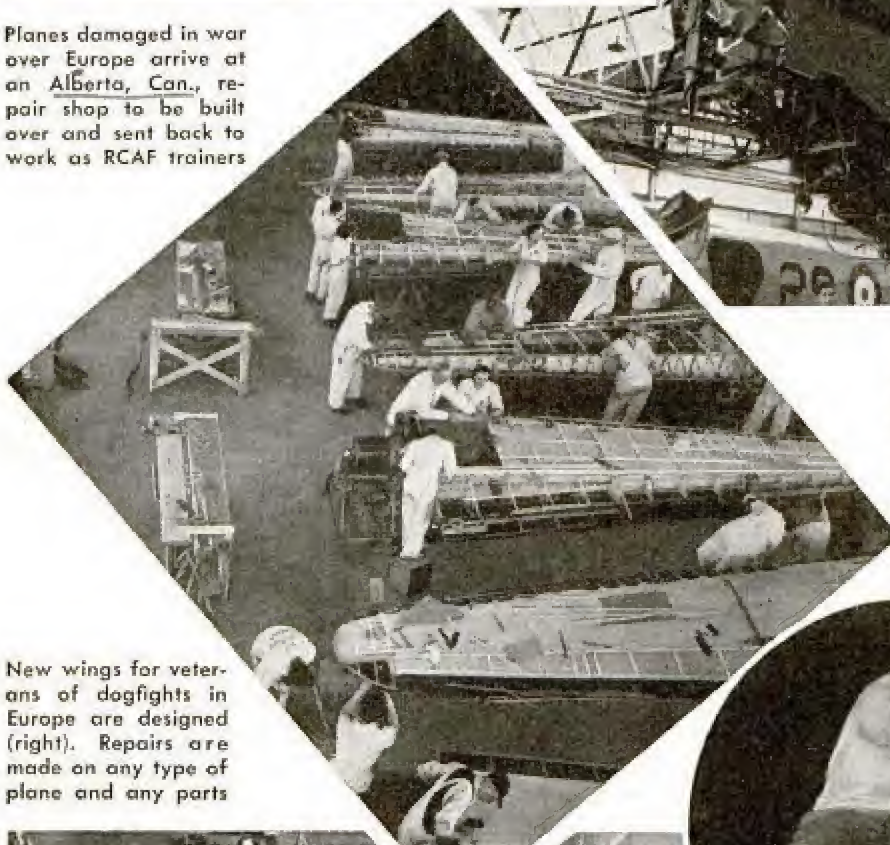
Replacing the slow, tedious inspection of gun barrels by feeler gauges, the inspector views the interior of the barrel under strong light with a "borescope"

*Mr. Allen Warren Elliott
1 Park Ave.
N.Y. N.Y.*

Plane Hospital Turns "Scrap" Into Scrappers N 176



Planes damaged in war over Europe arrive at an Alberta, Can., repair shop to be built over and sent back to work as RCAF trainers



Wrecked in crackup or combat, (above) planes are shipped from overseas zones of combat. Often wings are nearly shot off, or noses smashed, but in about three weeks of "face-lifting" they emerge, almost as good as new

New wings for veterans of dogfights in Europe are designed (right). Repairs are made on any type of plane and any parts



Miss Roy



Women work alongside men to keep lines of rebuilt planes moving, as the woman mechanic above, putting finishing touch on fuselage, demonstrates. Left, a single-motored craft is given a nose-to-tail inspection by mechanics. Such repairs take the load off production lines producing new planes by providing "reborn" ones to act as trainers. Plants engaged in producing new planes can devote more effort to making combat craft for use overseas

Thomas G. Stenson, Jr.
3872 Franklin Ave., Los Angeles, California 71 161

TAKE CARE of YOURSELF



Seized from behind, officer twists body to one side and elbow jammed into attacker's midriff paralyzes him

IF YOU should have the misfortune of finding a gun jammed into your back some night with the harsh command to "Stick 'em up!" what could you do?

You could submit and be robbed, of course, or you could turn around and fight, possibly getting shot for your foolhardiness.

Or you might step to one side, take the gun from the stick-up artist, and knock him out with it.

As easy as that? Yes, and no. Officer Jack Sergel of the Los Angeles Police Department is going to show you how, but it won't be easy until you become letter-perfect by practicing with a friend.

Sergel has made a hobby of personal combat, everything from boxing and wrestling to the knife throwing of Latin America and "la savate" of France. He knows how the Chinese use their fists, fingertips, knees, and elbows in the "sick kung foo" combat drill, and he is one of the few Caucasians who have attained the rank of second degree black belt in Japanese judo. Judo is a modern school of jujitsu that combines the best features of the 16 other jujitsu systems.

Knowledge and skill take the place of strength in jujitsu. You keep your adversary turned away so that he can't reach you, and you control him by keeping him off balance and by applying simple leverage grips. You rarely move toward him and you take advantage of his own forward rush to bring him down.

If an intruder jams his foot into the doorway, kick him on the shin and jump on his instep, or (below) crack his arm across sharp edge of door





Pivot from hips spins attacker into the air

An experienced judo fighter can do more with a shrug than an untrained man can do with great exertion. He can control an adversary without harming him, can painlessly make him unconscious, or can break an arm or kill him. Some of Sergel's advice is based on jujitsu tactics.

Let's start with a fairly easy maneuver. Suppose some one jumps you from behind, pinning your arms to your sides. Thugs who attack women often use this approach, throwing one arm around her body and one hand across her mouth to prevent outcry.

A woman who has practiced the defense of this attack so much that it becomes instinctive will find that she has thrown her attacker to the ground almost before she realizes what has happened. An untrained woman wastes her strength, and possibly chokes, trying to remove the hand from her mouth. A trained woman forgets her mouth. First, she squirms her body to one side, the side that gives her the most room. Then she jabs an elbow with all her strength into the unprotected stomach of her attacker. This blow to the solar plexus starts to double him up. Then she stoops forward from the hips, possibly dropping to one knee, and uses her hips to pivot the



Judo requires skill rather than strength as girl here proves by spinning heavy man over her shoulder to mat



attacker's weight into the air and down in front of her. She may have been able to reach one hand across her chest and grab the thug's shoulder. This helps her throw him forward with a crash. Then she may run, or she may stamp on him with her sharp heels.

Will this maneuver work? It will, with practice. Even a small person has surprising strength in his legs and thus can pivot



When attacked from behind by armed man, raise arms part way

heavy weights across his hips. It is best done rapidly, but you should practice slowly until you can do it surely. Don't jerk from one part of the maneuver to the next. The smooth rhythm and timing that comes with practice are important. Be rough only in an emergency; "pull your punch" when delivering the elbow blow in practice.

Disarming a man with a gun or knife pointed at your back is more complicated, takes more practice, but is just as effective. Whether or not you are commanded to raise your hands, raise them part way. Then whirl suddenly to the right. This pivot takes you out of the way of the gun barrel and gives you a chance to grab the gun with your left hand. Seize it across the hammer, your fingers stretching over the other man's fist. Now grab the barrel with your right hand, palm up. Twist the muzzle toward the attacker's body. Turning the gun in this way doubles up his right wrist and weakens his grip on the gun. Shift the grip of your left hand to hold his wrist in this bent position, pull the gun free with your right hand, and while still controlling him by your grip on his right hand, deliver a crashing blow at his head with the gun butt.

Practice this one with a friend, having him point the gun toward different parts of your back until you can handle it in any position. Rehearse slowly until you become automatic. When you become proficient it will no longer be necessary for the gun to touch you. As you whirl around, your hands are coming down ready to reach for the gun no matter where it is. Don't be afraid that the thug will have time to shoot you while you are pivoting. You will be out of the way before he can re-aim it. This maneuver demands smoothness and economy of motion—and weeks or months of practice.

Suppose someone comes at you with his left arm up on guard, possibly with a knife in his right hand. You can



Spin out of line of fire, hitting gun aside with right hand, left hand poised to grasp weapon by the butt to make it harmless

Gun is seized across the hammer with fingers stretching across attacker's fist. Next, "victim" takes gun barrel in right hand



throw him face down or snap his arm, which ever you wish. So, in practicing this one, always do it gently. When the attacker comes toward you, left arm out, grab the back of his left hand in your left palm. Now twist his hand down and to the left, doubling up his wrist. At the same time, push his left elbow up with the heel of your right hand. He is at your complete mercy, for you have turned him away so that he can't touch you, and leverage on his arm will make him do anything you wish. Use a little more pressure and step to your left. He automatically sprawls face downward in the dirt.

In his work as a police officer, Sergel is occasionally attacked by a dog. He's never

been bitten and he has never harmed an attacking dog. He shoots his left hand over the dog's head, grabbing it high on the neck. The dog raises his head to get at this arm, giving Sergel the chance to drive his right hand, thumb and fingers extended, into the dog's neck. A little pressure straight back with the thumb and fingers into the blood vessels at each side of the dog's wind pipe puts it to sleep for a few minutes.

Sneak thieves like to snatch purses and packages, and the best way to prevent that is to carry your bundle under a doubled-up arm as if it were a football. Other kinds of robbers open your car door and hop in when you are making a traffic stop. The obvious prevention of this is to keep your car doors locked. If your car has a running board and a thief jumps on it, you can do just what a school teacher did under those circumstances. She jumped her car ahead in low gear, then jammed on the brakes, catapulting the thief to the pavement. Then



When attacked by a dog, feint with left hand over its head, and grasp it high on the neck; pressure of other hand on its windpipe puts it to sleep

she backed over his recumbent figure, and sat there, blowing her horn for help.

The intruder who rings your doorbell, plants his foot in the doorway and then pushes his way in, is easy to handle. You don't have to know judo to hold your weight against the door, kick him sharply on his shin bone and then slam your foot down on his instep. Or, if he has managed to get his arm inside the door, grab his hand and bring his elbow back across the edge of the door. Either method will change his intentions.

But if you do know judo, and some one tries to force entry this way, invite him right in. You can take care of him with hardly a pause as you go to the telephone to call an ambulance to carry him away.

Judo isn't merely a system of protection. As a sport it keeps the body limber and can

be enjoyed by young and old. It doesn't have to be rough. The rules are that you can practice bone-breaking holds, but you can't go through with them. Only advanced students are taught the most dangerous leverages and the use of nerve centers. Perfection takes years of practice. Judo is being taught to the army, and its study would benefit us all.



Gunman's wrist is doubled back, and gun now points at him. A wrist grip makes gunman's hand powerless, victim now is attacker

Weapon is wrested from the gunman's hand, and erstwhile victim delivers a blow at attacker's head, retaining paralyzing grip on wrist



71258

Air Age Map Used to Teach Global Geography

Seattle Washington, Junior High School



Geography of an era when land-sea frontiers are meaningless to an aviator who can fly with equal facility over either water or land has been brought to the classroom by the installation of air maps. These omit the familiar outlines of continents and oceans, and utilize only the place-names of cities or islands to show their relationship to each other, and their actual, air-line distances apart. To further emphasize the idea that flight is not halted by topographical obstructions, the map is centered on the North Pole instead of on the Equator.

Air-age map, centered on the North Pole instead of the Equator, shows relative position of world's cities by new geography

71211

Side Blisters on Navy "Cats" Mount Free-Swinging Guns

Free-swinging .50-caliber machine guns are installed in each blister of the Navy's big flying boats, the Catalinas, used for patrol, bombing and an endless variety of other air-sea wartime tasks. Fire power of the PBY-5A, with its blisters protruding from each side of the hull, makes it better able to defend itself in encounters with fleetier, more maneuverable pursuit planes, its natural enemy.



Free-swinging machine guns on Catalina patrol planes can give a blistering reception to attacking enemy interceptor aircraft

Folder Speeds Delivery Of Surgical Dressings

71340

Surgical dressings are folded from three to five times faster than by hand with a mechanical device developed by du Pont officials and adopted as standard by the Delaware Red Cross for folding the smallest size dressing. The folder is described as a composition board base with hinged flaps that are folded over with the gauze in a set sequence, creasing the material precisely to measurement.

Dr. Philip W. Burdette
C. J. du Pont de Nemours & Co., Inc.
Washington, Delaware

Modern "Chuck" Wagon Invades War Plants



Along the miles of corridors in America's busy war plants moves a caravan of lunch wagons loaded with wholesome hot and cold foods that help keep workers at top production. The wagon above is typical of many used in Ford factories. Balanced meals brought to work-bench save hundreds of hours



Right, another time-saver is the Lumarith plastic lunchbox. Its transparent sides reduce war plant inspection to a passing glance at entry



More salads mean more healthful vitamins—more vitamins mean more tanks and airplanes built by alert war workers. In the Ford Willow Run plant, a single salad counter (above) contains 15 different salads containing head lettuce and tomatoes, cottage cheese, celery, carrots, fruit and other vitamin rich foods. Left, rolling cafeteria units like this are hauled by tractor-train down the long aisles of Boeing Aircraft plant

Mr. Thomas G. Stinson, Jr.
 3972 Franklin Ave.
 Los Angeles, California

N 137



DOG FIGHTING with CAPTIVE MODEL AIRPLANES



Exact scale model of a Martin bomber, shown in these closeups, is of a captive type flown at the end of 100-foot control line

Bomber model has a tricycle landing gear, plastic nose, gunner's blister

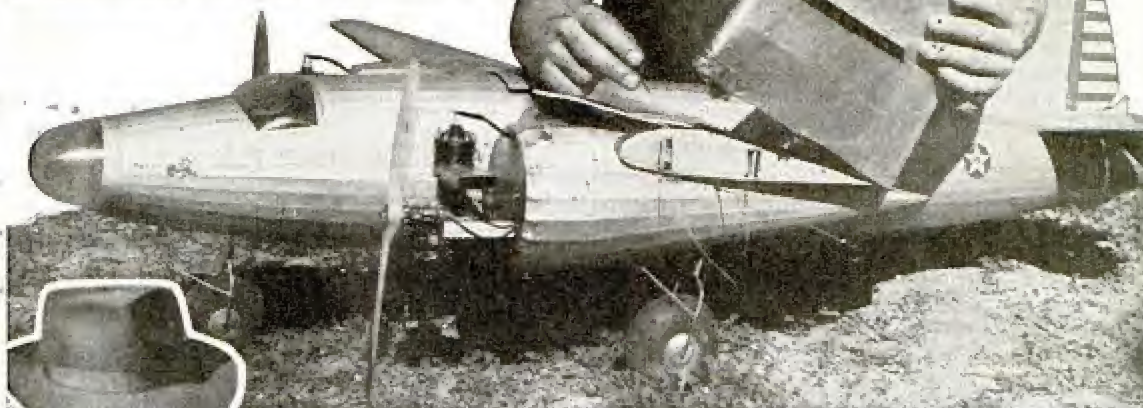
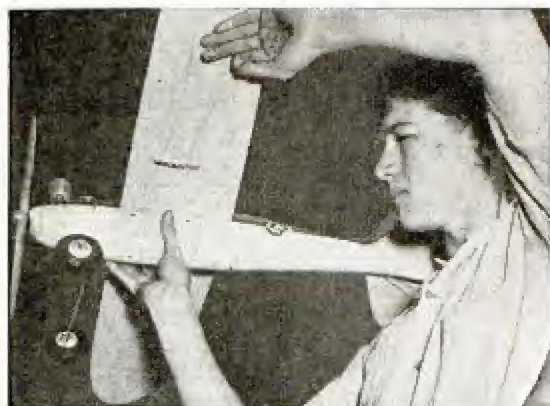


In remote-controlled dogfight (left) models perform like full-scale planes; leader is attempting to evade a pursuer on his tail

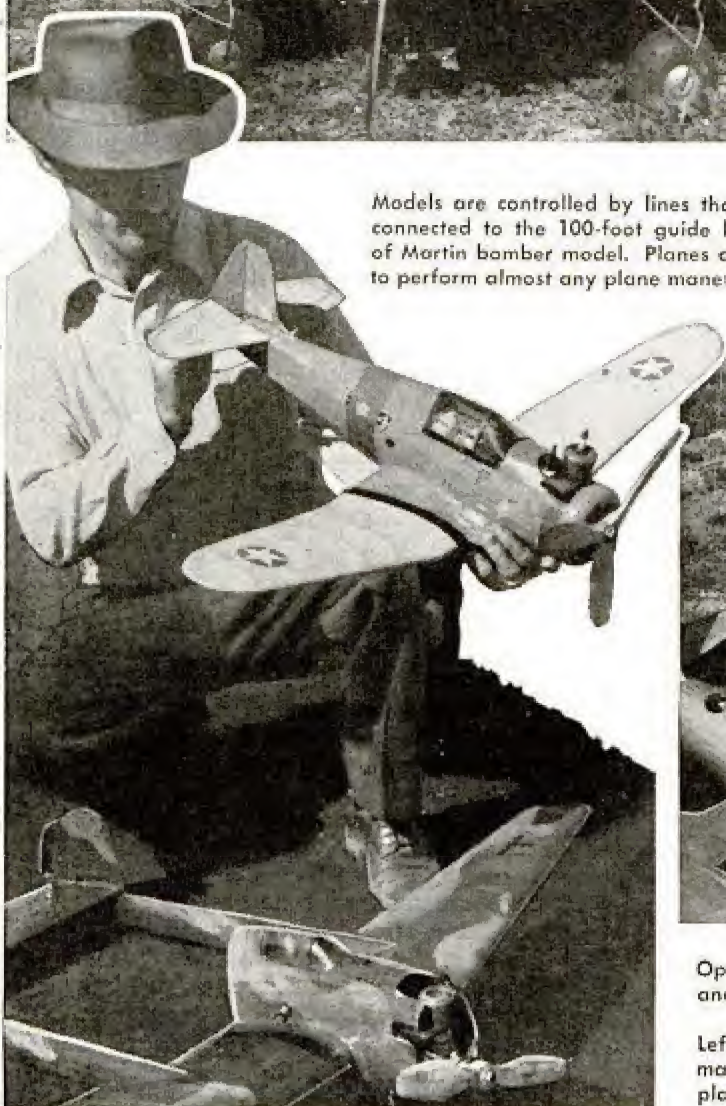
Skeletonized speed models like one below have surpassed 70 miles an hour. Notice plug to which starting batteries connect



Ref: John Haydel, 626 S. Burnside
 Los Angeles, Calif.



Models are controlled by lines that operate the midget plane's elevators, connected to the 100-foot guide lines (top). Above, attaching the wings of Martin bomber model. Planes can be made to zoom, loop, hedge-hop—to perform almost any plane maneuver except barrel rolls—during dogfights



Open compartments above contain batteries and controls to kill motors during flight

Left: Adjusting rudder to assure model of maximum speed. Foreground, German type plane, balsa frame with doped fabric skin

Capt. Raymond J. Maermon

Boots on Beach Patrol Dog Protect Feet From Cuts

N 237



Canvas boots lace over feet of dogs on beach patrol

Dogs that accompany Coast Guardsmen on beach patrol are outfitted with canvas boots to protect their feet from cuts—a danger where seashells line the sand at the water's edge. Laces of the canine overshoes are wrapped around the dog's leg above the boot top and tied.

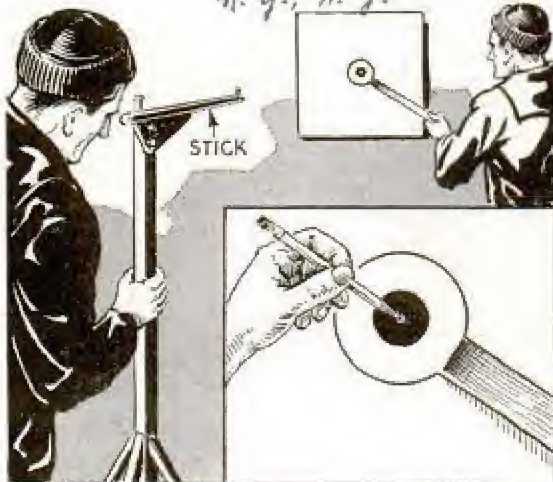
St. Charles & Hygiene

Gunless Range Trains Rookies For Expert Marksmanship

N 219

Accurate aim is taught prospective gunners at New York State Maritime Academy at Fort Schuyler without the use of

n. y., n. y.



Gunless sighting with stick; inset, marking a "hit"

any firearm. Toy pistols, a stick—anything that can be used to sight along—can substitute for a gun. A clean sheet of paper is tacked up as the "target." Then an aid holding a stick with a circular piece of cardboard on its end, with a small hole through a bull's-eye on the circle, places the bull's-eye over the paper and makes a tiny pencil mark through the hole. The trainee sights on this hole, and attempts to keep his aim fixed on the pencil mark. The cardboard circle is then withdrawn and moved about the paper target until the trainee calls halt at the point where he believes the original pencil mark was made. Then a second pencil mark is inscribed through the hole in the bull's-eye, and if the two marks coincide the trainee has held his aim perfectly.

Mileage Tape on Air Age Globe Measures Airplane Routes

N 326

Distances as the crow or Flying Fortress flies are measured in a jiffy with a globe equipped with a transparent plastic mile-



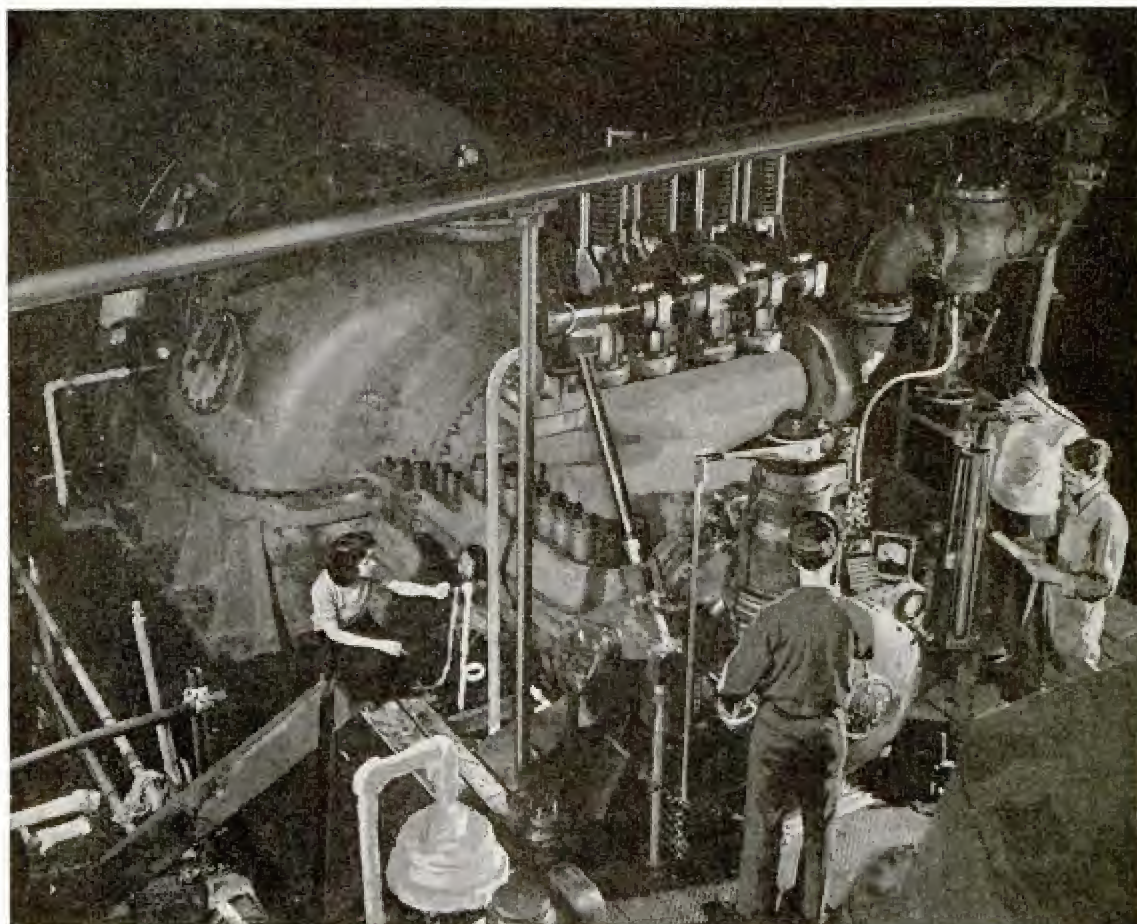
Plastic tape held to globe measures air distances

age tape. When not in use, the tape is wrapped around the glass base of the globe. Designed for the air age and to facilitate the study of global warfare, the globe is a free-floating sphere without the traditional axis rod, meridian, or horizontal ring. It can be lifted from the base for close study. The polar regions, inaccessible on the old "ball-on-a-stick" type of globe, are clearly visible on the new globe, and air routes of the future across the Arctic are measured easily with the tape.

¶To learn where to buy commercial products described in these pages, see the index.

Band M. C. Hally & Co. 538 St. Charles St. Chicago, Ill.

Towed Generators Supply Emergency Power



"Floating power" accurately describes generator-boats built as emergency power sources for war plants

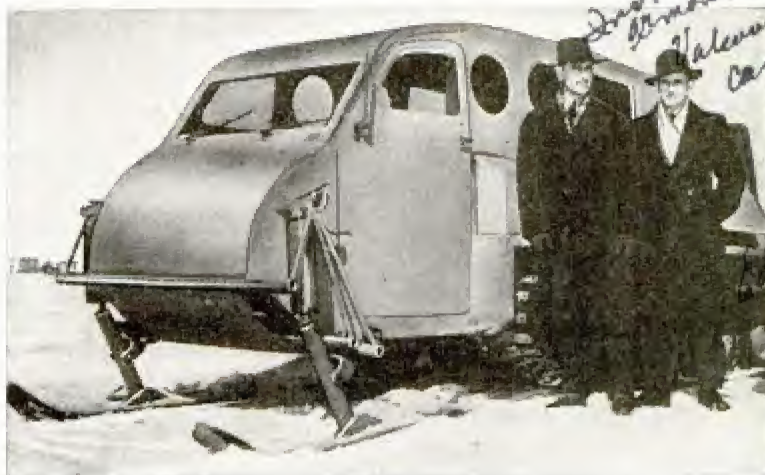
Emergency sources of electric power that can be towed rapidly to many war plants located on the inland waterways system are provided by 30,000 kilowatt turbine-generators, four of which are being constructed at a General Electric plant

to be installed in four "floating power" craft, for the Power Division of the War Production Board. In the event of a breakdown of the regular source of power, the floating plants could be towed in to avoid a break in the continuity of production.

Schneccady N.Y. Snowmobile With Tank Treads Carries Six Armed Men

Winter equipment for the Canadian army includes a half-track snowmobile, capable of carrying a half-dozen fully equipped men at speeds of more than 25 miles an hour over snowy terrain. Its forepart is mounted on skis, and the bulk of the machine rests on an endless track, resembling the tread of a tank. Power is supplied by a 95-horsepower automobile engine.

Tank treads and runners provide traction for snowmobile



*2 Co -
Dr. Donald Comberford
Valcourt, Que.,
Canada
Wright*

TRICKS of the SNIPERS

7/15/



Pacific, but on the Russian front and to a lesser degree in desert warfare. But it was the Jap sniper painted green and trussed in a treetop who focused the world's attention on a type of fighting that most generals had relegated to stories of Indian wars.

The Jap sniper has a thousand tricks and some 999 of them are now U. S. and Australian property after the campaigns of Sanananda, Gona, Buna, Guadalcanal, Cape Endiader and other points that mark the road to Tokyo. The effectiveness of the sniper in jungle fighting is evidenced by a U. S. officer who reported that at least half of his losses were due to rifle shots and not machine gun bullets or bombs. Most snipers use smokeless powder and many rifles are equipped with silencers. Often the first warning of snipers is the spat of a bullet against a log or a hiss as it cuts through the mangrove.

Left, scouting party in jungle with nets to ward off insects. Below, lookout for Jap snipers

AN ALERT American patrol moves through the steaming jungle of New Guinea with the stealth of a panther. Suddenly, a sharp explosion, like the report of a gun, freezes the men in their tracks. The shot seemed to come from the dense foliage 15 yards ahead.

"Hold your fire," hisses the patrol leader. His keen ears have warned him that this is another Jap trick to draw fire and reveal position. He recognizes the explosion as that of a "firecracker bullet" that explodes when it hits. It was fired by a sniper in a distant treetop who had learned of the presence of the patrol through his "vine wireless."

Somewhere along the way a member of the patrol had kicked a fence of tangled vines. The sound of movements is transferred along this cleverly constructed fence and is picked up by the monkey-sharp ears of the Jap sniper.

Military experts confess that the most baffling "secret weapons" to combat in this war are the tricks of snipers. This is true not only on the jungle front of the South



A favorite trick of the Japs is to pin down an advance unit with machine gun fire and then pick the men off one by one with treetop snipers filtered behind our lines in the night. Many a Jap has realized in his dying moments that this trick works both ways.

One day a corporal in a supply column moving through a cocoanut grove noticed a Jap sniper, apparently shot through the head, hanging from a tree. His rifle swung beside him. After having passed seven dead snipers hanging from trees along the footpath, the sight of another brought no comment. Then in a flash, the corporal lifted his Garand and fired. When his sergeant reprimanded him for drawing attention to the column and wasting ammunition on a dead Jap, he replied:

"Dead Japs don't have twitchy toes."

A few yards off trail, camouflaged sniper (right) is invisible. Below, U. S. jungle fighters "muddy up"



Left, Russian sniper covered with foliage to fool Nazis, stands in exposed position near river bank

That guy was just playing dead."

The troops call the Jap treetop fighters "suicide snipers." Most of them are trussed in their lofty perches by vines, ropes or strips of blanket. Even their rifles are strapped beside them so that if they are shot nothing will fall. Thus, no one can be sure they are dead, and coming close to find out may bring a soldier within range of another sniper.

One moonlight night two American soldiers on patrol duty stayed their trigger fingers while they watched three snipers preparing their position. Two of them climbed a 100-foot palm tree. They ran up the tree like monkeys with the aid of splay-toed sandals which they all wear.



Crouched in leafy hideout, sniper remains motionless for hours

One of the soldiers estimated that they made the climb to the top of the tree in three minutes flat. Then they made a hoist and the man on the ground sent things up to them by rope.

After stuffing their pockets with ammunition, and what was probably rations, the two in the tree threw out ropes and drew the tops of three trees together to make a leafy bower. About that time the patrols

broke up the party and Hirohito was minus three more snipers.

The Japs also have a mobile type of tree sniper who never shoots twice from the same position. He uses vines to swing from tree to tree monkey fashion.

Another trick is the dummy sniper. A straw-filled dummy is manipulated with cords by a sniper from a nearby tree. When the dummy's movements have given away his position and he has been "shot" the patrol advances only to be mowed down by the bullets of the live sniper.

Every gun position in the jungle is guarded by a network of suicide snipers. When U. S. tanks were used in New Guinea, moving ahead of the infantry, they had to rake the treetops with machine gun fire as they advanced on heavily fortified Jap positions. The troops call this tactic "hosing" the treetops.

When a communication line goes dead in the jungle, the repair crew and their escort know that a sniper trap has been laid. As the

crew makes a cautious advance, treetop lookouts scan every leafy hideout with powerful binoculars. These lookouts develop woodsman's eyes that would do honor to a son of Daniel Boone. A slight movement of a dark shadow on a limb or a bit of wilted foliage may reveal the sniper's position. The repair crew, like all jungle fighters, look like a bit of tropical scenery themselves. Their clothes are green and

Bushmasters learn tricks in friendly Panama jungle which they will put into practice in South Pacific



84 Pvt. Edgar
R. Pringle
Cleveland, Ohio

Cpl. Ignacio
Castro
Douglas, Arizona

POPULAR MECHANICS
Pvt. Leo Hernandez
Flagstaff, Arizona

usually muddy as are their faces and hands. Leafy branches hide their helmets. When they are still an enemy platoon may pass a few yards away without suspecting their presence.

Good camouflage is as important to a jungle sniper as a good rifle, and its possibilities are unlimited. In Bataan, the Japs covered their bodies with green paint, but our camouflage experts have found that the effect is no better than that of smeared mud. The jungle is one place where cleanliness doesn't pay, for clean human skin shines like a beacon. Aside from keeping his face and hands dirty, the smart sniper rubs every exposed metal surface of his equipment with mud. He even uses camouflaged ammunition — smokeless powder.

American snipers, deadly combination of sharpshooting rifleman and jungle fighter, have adopted the best Jap tricks and added ingenious ones of their own. Many of these tricks are military secrets. We learned the Jap tricks the

U. S. para-ski soldiers (below) camouflaged to match landscape



In jungle tactics, machine gun fire flattens foe for snipers. Left, sniper's suit is invisible



hard way and that is exactly how they will have to learn ours.

In the race to outwit the crafty Jap jungle fighter, the U. S. is now training dogs to spot snipers. Many dogs have been trained in Hawaii and are now on duty helping spot riflemen for scouting parties. Hounds that can lead hunters to a treed coon at night can just as easily lead soldiers to a treed Jap by day or night. The dogs are also used as guards at night to warn of raiding parties. Recently, a cocker spaniel, Jojo, saved an airplane crew sleeping in a Solomon Island jungle.

Russian snipers use tactics more akin to modern warfare than the jungle fighters, for they work more closely with troop units. As in the jungle, every sniper is his own general but his communication lines are usually better and he can play an important part in directing artillery and mortar fire. The Soviet sniper's targets are officers, observers with periscopes, gun turrets and vision slots in tanks. Like the





From his treetop perch on South Pacific island, an American marine uses binoculars to hunt Jap snipers

jungle sniper, he takes his position at night, but in a dugout or abandoned building instead of a treetop.

Every Russian sniper who is worth his borsch has a special bag of tricks all his own. One fellow carries hand grenades, and Molotov cocktails in the form of bottles filled with explosive when he goes out on a mission to draw enemy fire and reveal a gun emplacement. Under cover of darkness he carefully places the grenade and bottle near his dugout. Then he takes up a position some distance away. The next

day, at a prearranged hour, he fires into the grenade and explodes it. If this fails to get enemy action, he fires at the bottle. Usually, the Nazis open up and blast away at the decoy. Then the Soviet artillery goes to work and wipes out the Nazi battery that has been impeding their advance.

The Soviet snipers usually work in pairs. They know all the tricks of seasoned German soldiers and can spot a recruit as far as they can see. Recently, two snipers were ordered by a company commander to "clean out" a bothersome Nazi dugout. They advanced in the night and took up a position in a bullet-shattered barn. Shortly after dawn a soldier, obviously a recruit, emerged from the dugout and walked toward a nearby trench. He was shot.

The snipers kept their eyes glued on a peep hole at the entrance to the dugout. Soon they were not surprised to see a pair of eyes at the slot. Casualty No. 2. Then the snipers waited. In a few minutes a head and shoulders appeared at the entrance. This brought chuckles instead of bullets from the snipers for they could tell that this obvious invitation to death was phony. The Germans hoped that a dummy would trick the Russians into another shot and possibly reveal their hiding place. But the snipers held their fire until many minutes later when the unmistakable head of a real soldier appeared. After that the Germans remained dug in until they could escape in darkness.

The Soviet sniper often wears white clothes in winter the color of dirty snow. He hides half-buried in snowy bluffs and throws enemy units into confusion by picking off their leaders. Russian snipers also play an important part in street fighting, usually taking positions in buildings at intersections commanding four avenues of approach. The sniper takes desperate

chances. He knows he is the most hated by the Nazis of all Russian soldiers and that if he is captured death awaits. He also knows he is one of the most highly respected fighters of World War II.

Snipers who operate in city, mountain, plain, desert or jungle, all know that the secret of a long life is learning all the tricks of the enemy, outwitting him in every maneuver with new tricks and beating him at his own game.

Shooting while standing on firing steps of a two-man foxhole



*General Electric X-Ray Corp.
2012 W. Jackson Blvd.
Chicago, Ill.*

Suspicious Package X-Rayed to Detect Bomb

Included in the equipment of the mobile crime laboratory of the Illinois State Police is a portable X-ray device, fitted among other uses to examine suspected packages to determine whether they contain bombs. Use of such portable equipment makes it feasible to take the package to a remote area for examination, where a possible explosion would endanger fewer persons.

Inspection of a suspicious package by portable X-ray is demonstrated by police attached to the Illinois mobile crime laboratory



Swamp Glider for Rescue Work Can Cruise Over Mudflats

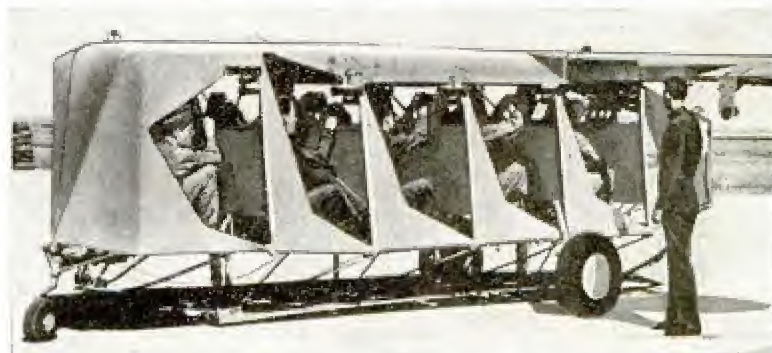


Should a pilot, forced to bail out over swampy terrain near a West Coast airfield, land in an inaccessible marsh, his chances of rescue are heightened by the presence of crash boats termed swamp gliders because of their ability to speed over mudflats where only inches of water are available. Such a craft is powered by an airplane propeller and steered by a wind rudder, much as a plane is guided. Its flat, shallow bottom enables it to skim over the surface.

Pilot's rescue craft is of such shallow draft that it cruises in a swamp

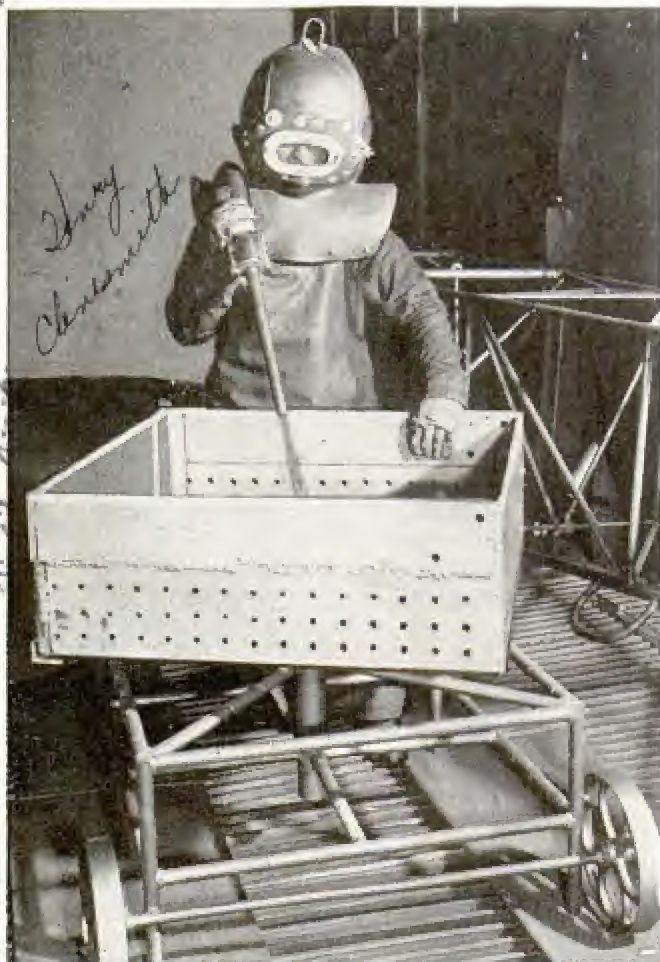
Glider Mechanics Use a Mockup to Study Repair of Instruments

At a school for glider mechanics in Texas, students learn instrument repair and maintenance in a five-place "tandem" glider mockup. Every glider mechanic must be an aircraft instrument expert, for although gliders have no engines or propellers they have a complete instrument set and an electrical system.



N 315

Sandblaster Cleans Plane Parts Held in Perforated Box



Looking like a deep-sea diver out of his element, this sandblaster cleans airplane parts held in a perforated metal box

Attired in a 14-pound helmet resembling ones used by deep-sea divers, a sandblaster at Boeing Aircraft Co. quickly removes scales of dirt from small airplane parts with his blasting hose, cleaning many parts at the same time in a perforated box. His headgear, protection against the clouds of knife-edged sand particles raised by his work, brings clean, filtered air to his nostrils.

Two-Year War Production 15 Times That of Japan

In a little more than two years the United States has produced as much war equipment as Japan in 30 years, Russia in 20 years, and Germany in 10, according to Harold V. Coes, vice-president of Ford, Bacon & Davis, Inc. A 600

percent increase in shipbuilding is one U. S. achievement. Six years ago we had 10 shipyards with 46 ways able to accommodate large ships, and today there are 60 such yards with more than 300 ways. The 1942 production increase over 1941 was 400 percent, including six and one-quarter times as much ordnance and five times as many merchant ships. Machine tools were produced at seven times the peacetime peak. In a year and a half an entire synthetic rubber industry was born, capable of producing from 800,000 to 1,000,000 tons a year.

Left-Eyed Gunner's Sight Built for Ack-Ack Gun

In its original design, the Oerlikon rapid-fire antiaircraft gun had shoulder rests so narrow that they could hardly be fitted to a man of broad stature. In addition, the design was virtually nonadjustable, forcing a gunner who would prefer to sight through the left eye to use his right eye instead. Pontiac motor engineers redesigned the shoulder rests, allowing for vertical, angular and lateral adjustments, as a result of which broad and left-eyed gunners can quickly fit the rests to their shoulders, and fire from a comfortable position. In addition to assuring more deadly aim, the adjustment saves Uncle Sam \$24.74 on each shoulder rest made.



Redesign of the shoulder rests and sight of the Oerlikon ack-ack gun makes it easier for left-eyed, broad men to use it

H. W. Ayer & Sons, Inc.
30 Ruggles Place

Meister, Lucie

N 253
Michigan, Pontiac

Lancaster, Iowa



The CRAFTSMAN

Knockdown LAWN SET

PEG-FASTENED CHAIR AND
TABLE EASILY TAKEN APART
FOR STORING OR SHIPPING.
INTERLOCKING PARTS GIVE
EXCEPTIONAL STURDINESS

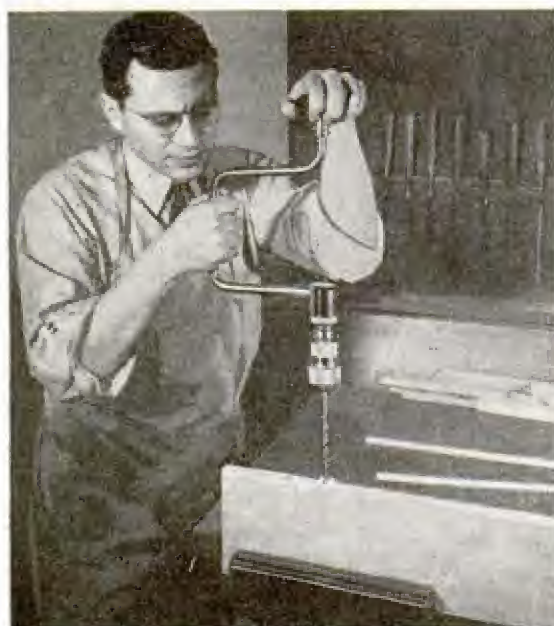


By W. Keith Vining

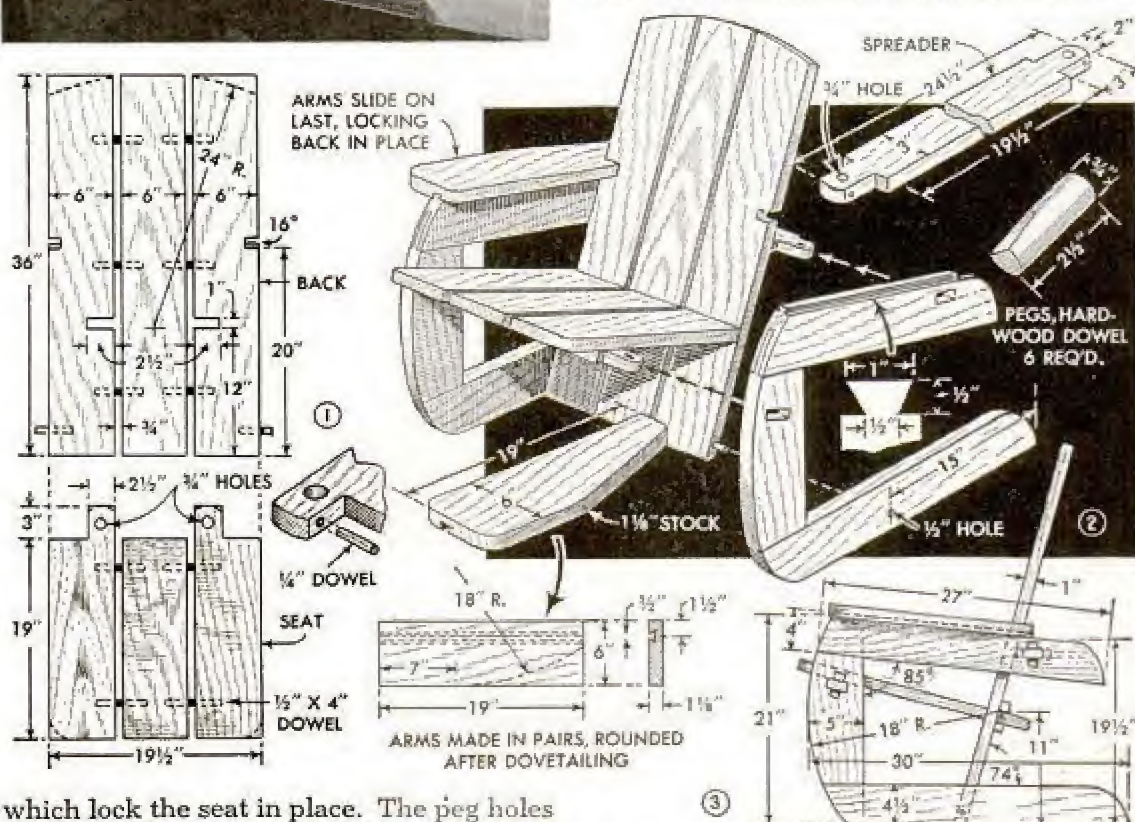
WHEN it comes to putting lawn furniture away for the winter, you'll appreciate having this novel chair and table because it can be taken apart quickly and stored flat in little space. The removal of six pegs is all that is necessary to dis-

mantle the chair, while in the case of the table, you simply slide the legs out of dovetail grooves in the underside of the top. The various parts of both items fit together in such a way that exceptional rigidity is provided without the use of metal fastenings. Cypress or redwood are the most durable woods to use, leaving pine as a third choice. Needless to say, a resin-type, waterproof glue should be used wherever required.

The chair: The $\frac{3}{4}$ -in. boards comprising the back and seat are bored edgewise to a depth of $1\frac{1}{8}$ in., so that when dowels 4 in. long are glued in corresponding holes, $\frac{3}{4}$ -in. spaces will be left between the boards as indicated in Fig. 1. The tabs or projections on the seat that pass through slots in the chair back, are reinforced with $\frac{1}{4}$ -in. dowels inserted crosswise through the ends, this being done before they are bored for $\frac{3}{4}$ -in. pegs



the chair are in position. These units, which are identical, are assembled from 1-in. stock according to Fig. 3. The mortised corners should be glued well and clamped. Additional strength can be had at these points by pinning the joints with dowels and cutting them off flush on each side. Note that the tenons at the upper corners do not extend all the way through as they do at the bottom. The dovetail tenon along the top and corresponding groove in the underside of the arm rest can be cut on the circular saw if you do not have suitable shaper cutters. In sawing the grooves, cuts are made first with the table tilted 45 degrees, after which most of the waste between the two cuts can be removed with the table in a horizontal position. A better joint will be had if the tenon part is cut first and then the groove made to fit it. Short dowels projecting from

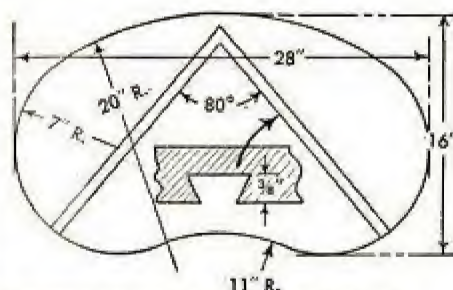
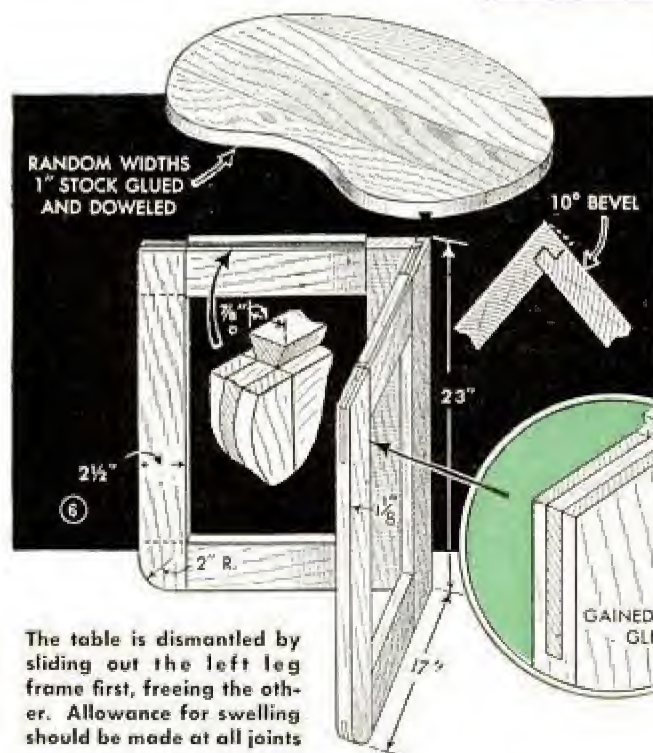
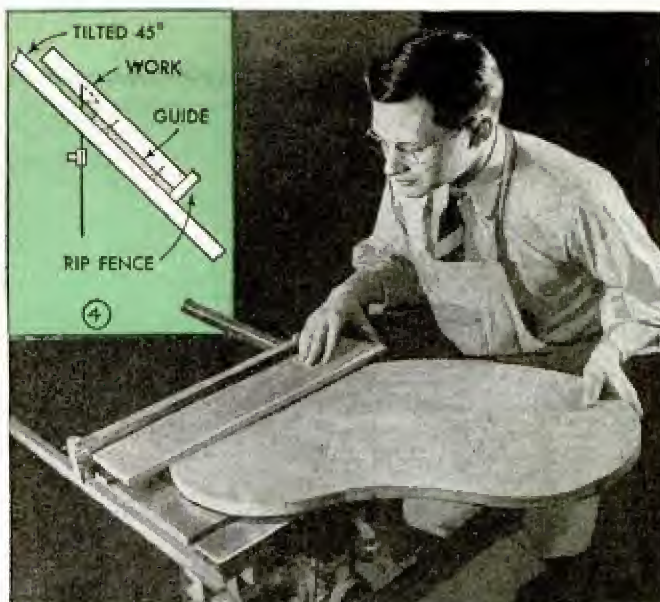


which lock the seat in place. The peg holes should be bored at a slight inward angle and should be located to make the pegs bind against the surface as they are driven in and thereby draw the parts tightly together. The foregoing applies also in making the two cross spreaders which tie the sides of the chair together and give support to the seat and back as shown in Fig. 2. You'll notice in the side view that the tab slots in the chair back are cut through at right angles to the surface, while the notches in which the arm rests slide are cut at an angle. However, it's best to mark and cut the latter after the side units of

the lower corners of the chair back engage holes in the side units to give the proper slant to the back. The chair is completed by sliding the arm rests in place and marking the point where the notches should be cut in the edge of the back.

The table: To cut the kidney-shape top to the pattern given in Fig. 5, it is first necessary to glue and dowel three or four narrow boards together edgewise. Fig. 5 also shows the position and angle of the two dovetail grooves in the underside of the top in which the legs slide. These grooves

are cut on the circular saw as detailed in Fig. 4. A scrap board tacked to the work parallel with the line of cut provides a straight side for guiding against the saw fence. The grooves are cut in much the same way as before. Here, of course, it is necessary to stop the cut before reaching the point indicated, after which the groove is completed with a chisel. After one groove has been cut, the position of the guide strip will have to be changed to the opposite side and the work brought down over the blade to start the cut. Corresponding dovetail tenons to fit the grooves just made are cut along the top edges of the legs after they have been assembled. The corners are put together in the



⑤ UNDERSIDE VIEW OF KIDNEY-SHAPED TOP

same way as those of the chair. Finally, the rear edges of the legs are grooved and rabbeted to fit into one another and form an angle coinciding with that of the grooves in the underside of the top.

If you want to finish the set natural, sand the wood clean and apply several coats of hot linseed oil, or finish with two or three coats of spar varnish.

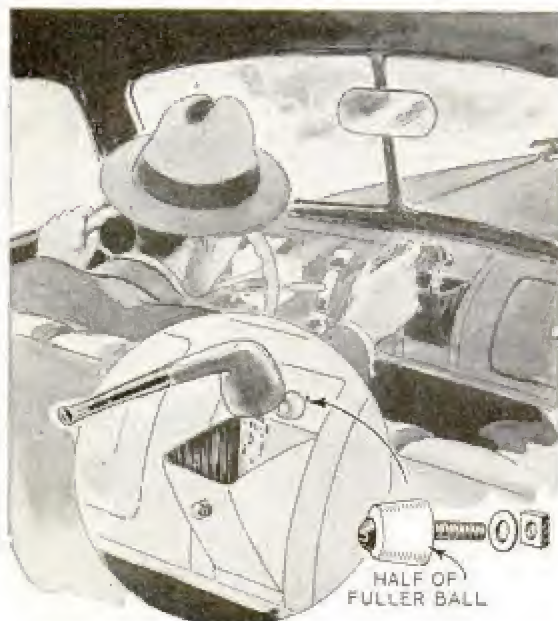
Hints That Help to Make Better Linoleum Block Prints

Difficulty encountered in making ink adhere to the oily surface of linoleum in outlining the pattern so that it can be seen easily when carving, can be overcome by first rubbing the surface with wood alcohol or strong ammonia water. This is applied with a wad of cotton, and has the effect of neutralizing the oily surface so that the ink will take hold readily as it is applied. It's important, of course, that you make no error in tracing the pattern, as the ink cannot be erased without partially wearing

down the surface below printing height. However, if corrections in the pattern must be made, the best way to block out the unwanted lines is with white ink or water color. Being opaque, this covers the black ink and at the same time does not destroy the original surface. If you find in applying the white ink that too much has been blocked out, it's an easy matter to re-establish the outline by going over it again with the black ink.

—A. J. Martone, New Haven, Conn.

Knocker Above Ash Tray in Car Aids in Emptying Pipe



Emptying your pipe while driving a car is no problem if you use a knocker above the tray as shown. The knocker is merely a fuller ball cut in half and mounted above the tray by means of a small stove bolt which fits in a hole drilled in the instrument panel. The rubber fuller ball will not damage your pipe when it is knocked against it to loosen the ashes.

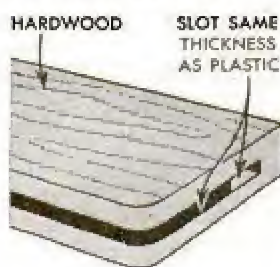
Bent Washer Under Thumb Nut Makes It Easy to Loosen



When a thumb nut has to be tightened and loosened frequently, you can avoid much of the finger strain by using a bent washer under the nut. The flexibility of the washer tends to keep the nut tight while the reduced area of friction under the nut makes it easy to turn with the fingers.

Producing Neat Edges on Plastic With Aid of Slotted Board

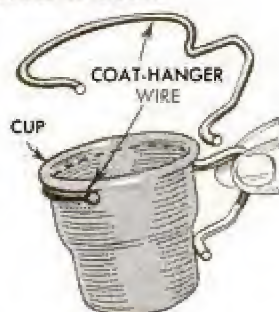
As the edges of thin plastic sometimes tend to chip when held against sanding and buffing wheels, it is often advisable to slip the work in a slotted piece of hardwood to pro-



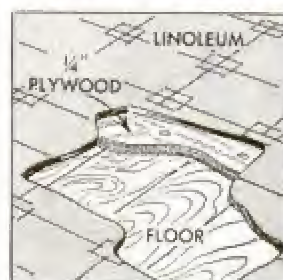
tect the edges. The slot should be cut a little deeper and slightly narrower than the stock so that clamps will not be necessary to hold the work in place firmly. Where small pieces of rare inlay woods are used, neat edges also can be produced by following the same method.

Wire Handle Snaps Around Cap Of Insulated Bottle

The difficulty of holding an insulated-bottle cap, when used as a cup from which to drink hot liquids, led one worker to fit a wire handle on the cap. This was done by bending a piece of wire coat hanger so that it would snap in place and grip the cap firmly. In many cases, however, it will not be necessary to remove the handle each time the bottle is packed in a lunch kit.



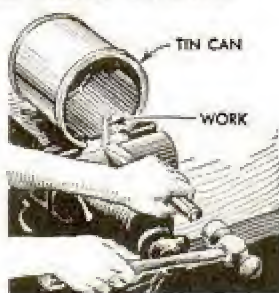
Plywood Provides a Smooth Base On Which to Lay Linoleum



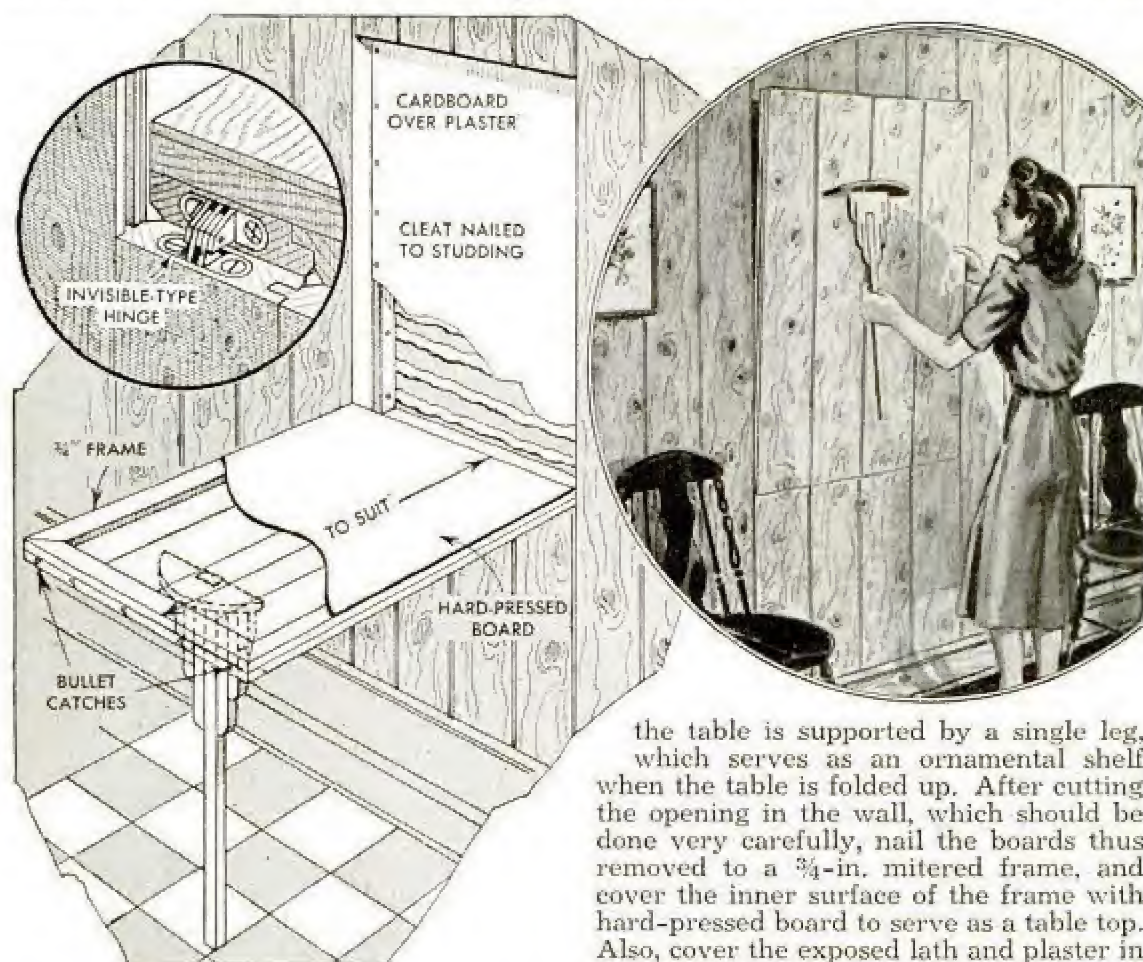
If linoleum is to last and have a neat appearance, it must be laid on a smooth surface. An inexpensive way of providing the smooth surface is to cover the floor with $\frac{1}{4}$ -in. plywood before putting down the linoleum. Fit the plywood joints carefully and fasten it down with nails. Sanding will remove any unevenness at the joints.

Can Catches Small Pieces of Rod Cut Off With Cold Chisel

Having several small pieces to cut from a rod, one workman used a catcher like the one shown to keep them from flying about when severed. The catcher is merely a tin can having the lid bent so that it can be clamped in the vise along with the work to be cut. When used in the position indicated, the can will catch the rod pieces as they are cut off.



Section of Wall Swings Down to Form a Table



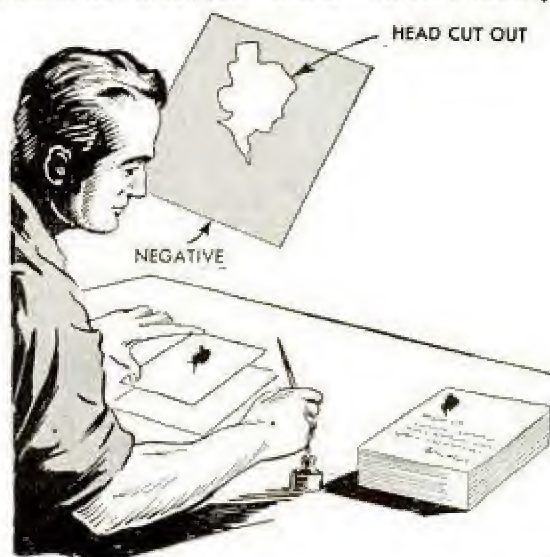
A disappearing table that folds up to become part of an attractive knotty-pine wall helps solve the problem of limited space in a kitchen or den. In the opened position,

the table is supported by a single leg, which serves as an ornamental shelf when the table is folded up. After cutting the opening in the wall, which should be done very carefully, nail the boards thus removed to a $\frac{3}{4}$ -in. mitered frame, and cover the inner surface of the frame with hard-pressed board to serve as a table top. Also, cover the exposed lath and plaster in the opening with heavy cardboard or wall board, and paint it to give the opening a pleasing appearance. If available, use invisible type hinges to pivot the lower edge of the table to the wall.

Your Profile Stenciled on Personal Cards and Stationery

Children and even adults will get a thrill out of stenciling their profiles on their stationery, invitations, announcements, etc. It's also fun to preserve the profiles of the children in stencils as they grow up. To make a stencil for this purpose, first photograph the profile and then cut out the negative as indicated. In use, the stencil is held firmly on the work, keeping the edges of the cut-out portion tightly in contact with the paper, which is stenciled by applying ink, showcard colors or even thinned paint with a stippling brush. If the latter is unavailable an old paintbrush having the bristles shortened to a length of about 1 in. will do.

❏ Save your waxed milk cartons for kindling. When flattened and ignited, a few of them will easily start a wood or coal fire.

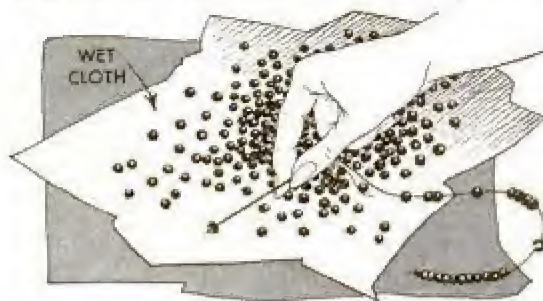


Solving HOME



SPRING CLOTHES-PINS

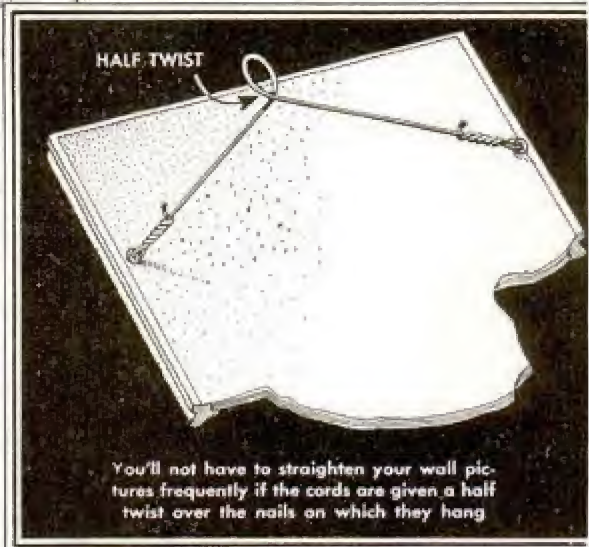
This handy "clothesline" provides an ideal place to hang small garments in an apartment or hotel room, as it can be folded flat when not in use



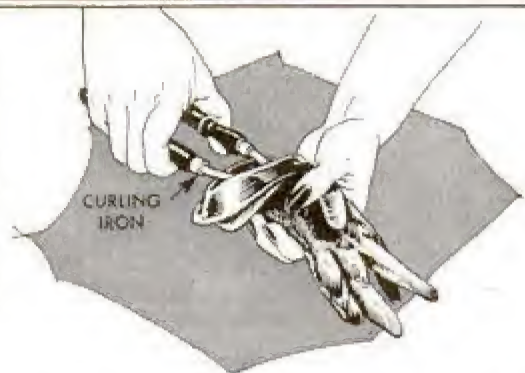
Next time you have occasion to string a number of tiny beads on thread, try spreading them on a wet cloth to fill the holes with water, which helps prevent them from slipping off the needle



When resharpening a broken, plastic knitting needle, it is often difficult to sand it smooth enough to compare with the original finish. However, by passing the needle through steam from a teakettle, the plastic is softened, which tends to blend the tiny scratches into a smooth surface



You'll not have to straighten your wall pictures frequently if the cords are given a half twist over the nails on which they hang



Above: Where a form is not available to slip in gloves after they are washed, a curling iron of the type shown is excellent for stretching the fingers before they are thoroughly dry. Left: One housewife prevents a small child from crawling under her pedal-driven sewing machine by using three sides of a large cardboard box to partially enclose the machine while it is being used

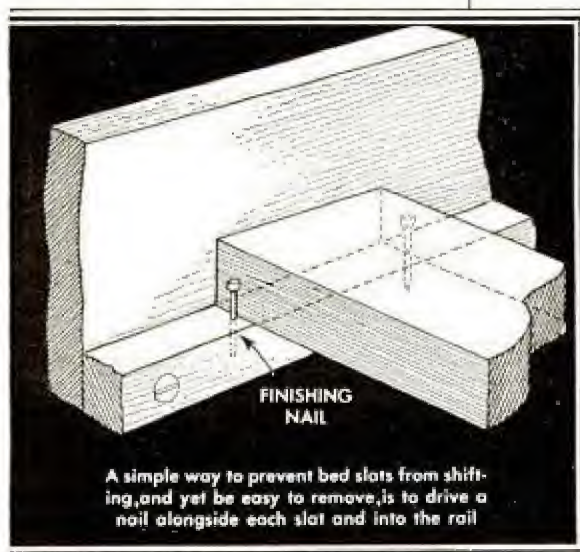
PROBLEMS



If the rubber gasket on your refrigerator door is wearing at the corners, apply strips of cellulose tape over the worn areas, which will increase the life of the gasket several months. In case the tape wears through before the entire gasket needs replacing, new strips may be added



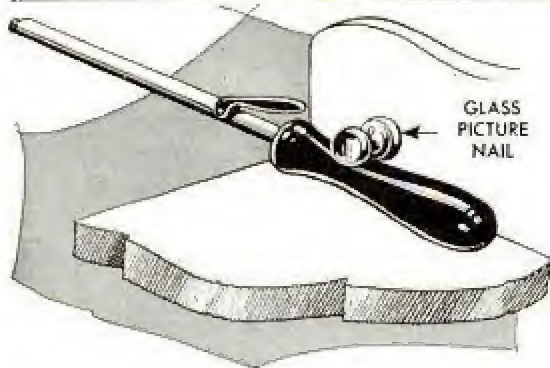
Waste corner space above a bathtub can be put to good use by screwing grooved cleats on the adjacent walls to support glass "slip-on" shelves



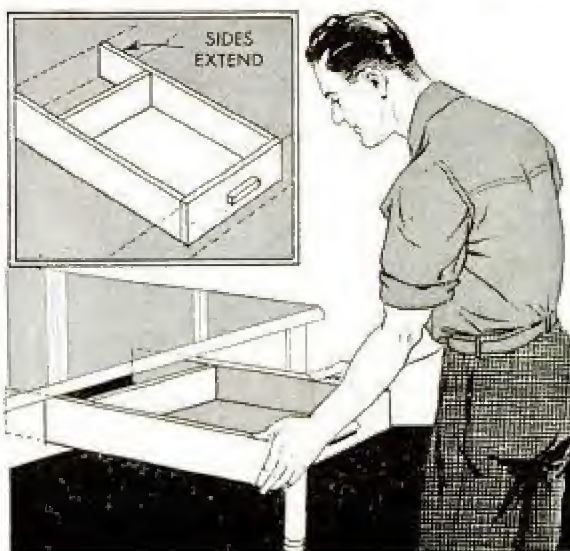
A simple way to prevent bed slats from shifting, and yet be easy to remove, is to drive a nail alongside each slat and into the rail



By turning a pair of rubber gloves inside out and applying strips of adhesive tape over the finger tips, you can provide adequate protection against long fingernails wearing holes in the gloves



Above: To hold a hot curling iron safely on a dressing table, just drive a glass picture nail into the back of the table near one edge and slip the handle under it. Right: In assembling drawers for tables, cupboards, etc., it's a good idea to let the sides extend at the back, as this eliminates the danger of dropping heavy drawers when opening them to reach something at the rear

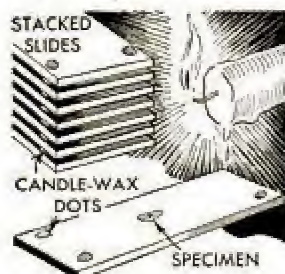


Musician Uses a Funnel as Stand For Clarinet While Practicing



In order to hold his clarinet safely beside his chair during practice or program intervals, a musician uses a small funnel, which is placed inverted on the floor. The funnel should be padded with cloth to avoid scratching the instrument.

Wax Spaces Microscope Slides To Protect Specimens

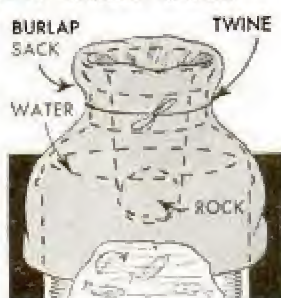


When specimens are left attached to microscope slides for further study, the slides may be stacked for storing without damaging the specimens by using dots of candle wax. These are

placed at the corners of each slide to space them so they do not touch.

Evaporation of Water From Sacks Keeps Minnow Cans Cool

The difficulty of transporting a number of live minnows from one stream to another in extremely hot weather led one fisherman to use burlap sacks to keep the water cool. The sacks were merely inverted over the cans and pushed down into the water as indicated. Pieces of twine held the sacks in place and



small rocks dropped into the pockets thus formed kept the burlap immersed so that it would provide wicks for carrying water to the exposed portions. In this way, evaporation served to keep the cans cool and the splashing water helped maintain the necessary oxygen supply for the minnows.

Dust Kept Out of Pistol Barrels By Oiled Pipe Cleaners

One gun collector solved the problem of preventing dust from collecting inside pistol and revolver barrels by packing oiled pipe-stem cleaners in the barrels, leaving the ends projecting so they may be removed. For long barrels, several cleaners are spliced together.



Refrigerator Defrosting Tray Emptied With Siphon

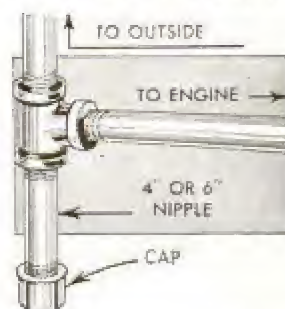


Instead of trying to remove a filled defrosting tray from a refrigerator, which is difficult to do without spilling water on the contents of the shelves underneath, one home owner siphons out the water

with a small tube. This takes only a few minutes, prevents damaging any of the food in the refrigerator and saves the time of wiping up spilled water.

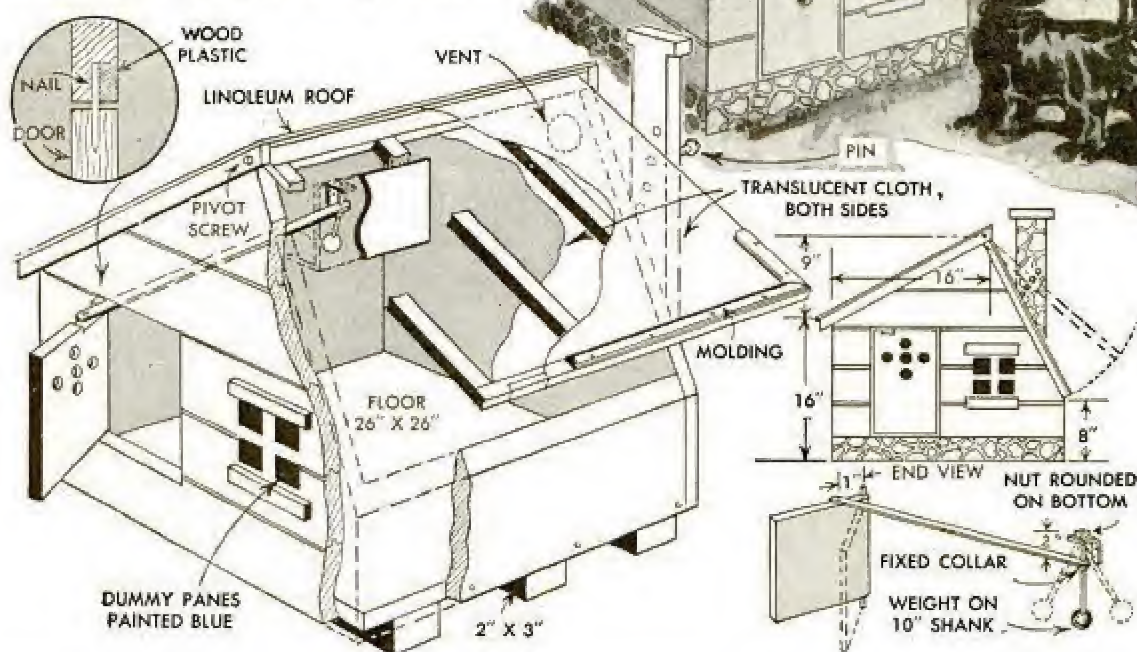
Moisture Trap for Exhaust Pipe

Gasoline engines that are operated in basements frequently give trouble due to moisture which condenses in the long exhaust line and runs back to the cylinders where it corrodes valves and fouls the plugs. To prevent this, one plumber installs a trap in the exhaust line by screwing a T-fitting to the end of the horizontal run and then dropping a 4 or 6-in. nipple from this. The lower end of the nipple is fitted with a cap, which is unscrewed at intervals to drain off the water.



Doghouse Has "Glazed" Roof to Admit Sunlight

Your dog will be warm and comfortable in this little house, which has one side of the roof hinged and covered with translucent cloth that admits ultra-violet rays. In addition to adjustment of the roof for ventilation, there are vents in the self-closing entrance door and rear gable. The floor is laid on 2 by 3-in. sills. If available, tongue-and-groove stock is used for the floor and walls of the house. Rough lumber is suitable for roof sheathing, which is covered with linoleum. The hinged side of the roof is simply a light frame covered on both sides with a single sheet of translucent cloth lapped and tacked at the bottom and covered with molding. The panel is pivoted with the top and is held open by a pin through holes in



the chimney, giving a wide adjustment. The door is swung on pins set in recesses chiseled in the wall, the recesses being filled with wood plastic. A connecting rod

which runs from the top of the door to a weighted pendulum brings the door to the closed position after the dog has passed through the doorway from either side.

Make a Compost Pile for Next Year's Garden and Flowers

One of the best and most inexpensive ways of conditioning the soil in your garden and flowerbeds is to work compost into the soil. Start the compost now so it will be ready by next spring. Rake up all dead leaves and vegetation and pile them in a corner of your lot. Throw some earth on them and also a little manure if available. Add all weeds that have not gone to seed and clippings from your lawn, together with clean vegetable and fruit parings and trimmings usually thrown into the garbage.

At intervals add a little fresh earth. Soil added to the compost has an important biological function. It introduces fungi, bacteria and small earth animals that reduce the raw vegetable tissues to good black humus that makes soil fertile. Therefore, the soil that is added to the compost pile should be of the best you have in the garden, already containing the germs of fertility. If you find you cannot get manure to add to the compost pile, use a little organic commercial fertilizer.



Building and Using a



Diced carrots in this heaping 12-qt. pail will be reduced to 2 qts. by dehydration. In weight, the reduction is from 16 lbs. to 2 lbs., 5 oz.—about 7 to 1 ratio. Each quart jar holds 25 normal servings

Reduced to a fraction of their original volume and weight, dehydrated fruits and vegetables take little storage space as compared to canned products, and they will keep indefinitely if properly prepared and put up for storage.

The two homemade dehydrators described in this article are built of hard-pressed or insulating board. The "kitchen" type holds 12 lbs. of vegetables on six trays, and the "community" type holds 18 lbs. in each of one, two or three sections, which are hooked together end to end.

Heat is supplied by a gas or smokeless oil burner to maintain a 125 to 140-degree temperature economically. An electrical heating unit consisting of a bank of lamps may be substituted if the load on the house circuit does not exceed the safety limits.

By Marston H. Kimball

PRESERVATION of fruits and vegetables without danger of botulinus food poisoning, which sometimes results when nonacid foods are incompletely sterilized, is possible in the average home by means of dehydration, or forced drying. While dried foods are not new, the process of dehydration has been developed so that high-quality vegetables will retain most of their flavor, vitamins and appearance. However, dehydration will not make good quality food from poor material. Although misshapen vegetables can be used without any impairment of their food value, no attempt should be made to dehydrate cull vegetables. For good results, vegetables should be of good quality, fully mature and fresh. Dehydration of food as can be done in the average home consists of the following steps: 1—Cleaning of food and cutting into small particles; 2—Blanching with steam; 3—Distributing blanched food on the dehydrator trays for drying; 4—Circulating heated air at carefully predetermined temperatures in the dehydrator to remove moisture; 5—Storing.

Vegetables are prepared for dehydration almost as though for immediate serving as in Fig. 2. They are cleaned, peeled or

scraped, sliced, diced, shredded, ground or riced. Steam blanching is necessary for all vegetables except onions and garlic. Cabbage may or may not be blanched. Blanching kills life processes or enzymes, which exist in every cell.

These substances will continue their activity in very dry food or under freezing temperatures and will cause gradual decline of quality, loss of flavor, texture and desirability. Blanching is best accomplished in steam. Boiling is not recommended because it causes excessive losses of vitamins. For steam blanching you can use homemade wire baskets suspended 1½ or 2 in. above boiling water in a large lidded canning kettle or unsealed pressure cooker. See Figs. 3 and 4. As an equally satisfactory alternative, a towel or square of muslin and a roaster can be used, in which case the prepared material is spread in a thin layer on the towel. Then the roaster lid is placed over it and the corners of the towel that are diagonally opposite are brought up and over the lid and tied together tightly. Thus the vegetables on the towel are suspended inside the lid after which the whole assembly is placed over boiling water in the bottom part of the roaster. As home blanching with improvised equipment is less positive than blanching in commercial dehydration plants where considerable steam pressure is used, the food must be spread thinly and the timing should not begin until vigorous boiling has been resumed after the cold load has been added, as blanching temper-

FOOD DEHYDRATOR

atures should be 190° F. or more. Also, as it is easy to overload a wire basket, it may be necessary to stir the vegetables slightly at about the midpoint of the blanching time in order to be sure that all portions receive sufficient steaming. A translucent appearance should develop in all pieces. The brief table given in Fig. 13 serves as a guide in the preparation and gives the blanching time of the most common vegetables.

In commercial dehydration where exact control is possible at all stages of the process, high temperatures are used at the start of dehydration. These are lowered at predetermined intervals as the products dry. As such exact

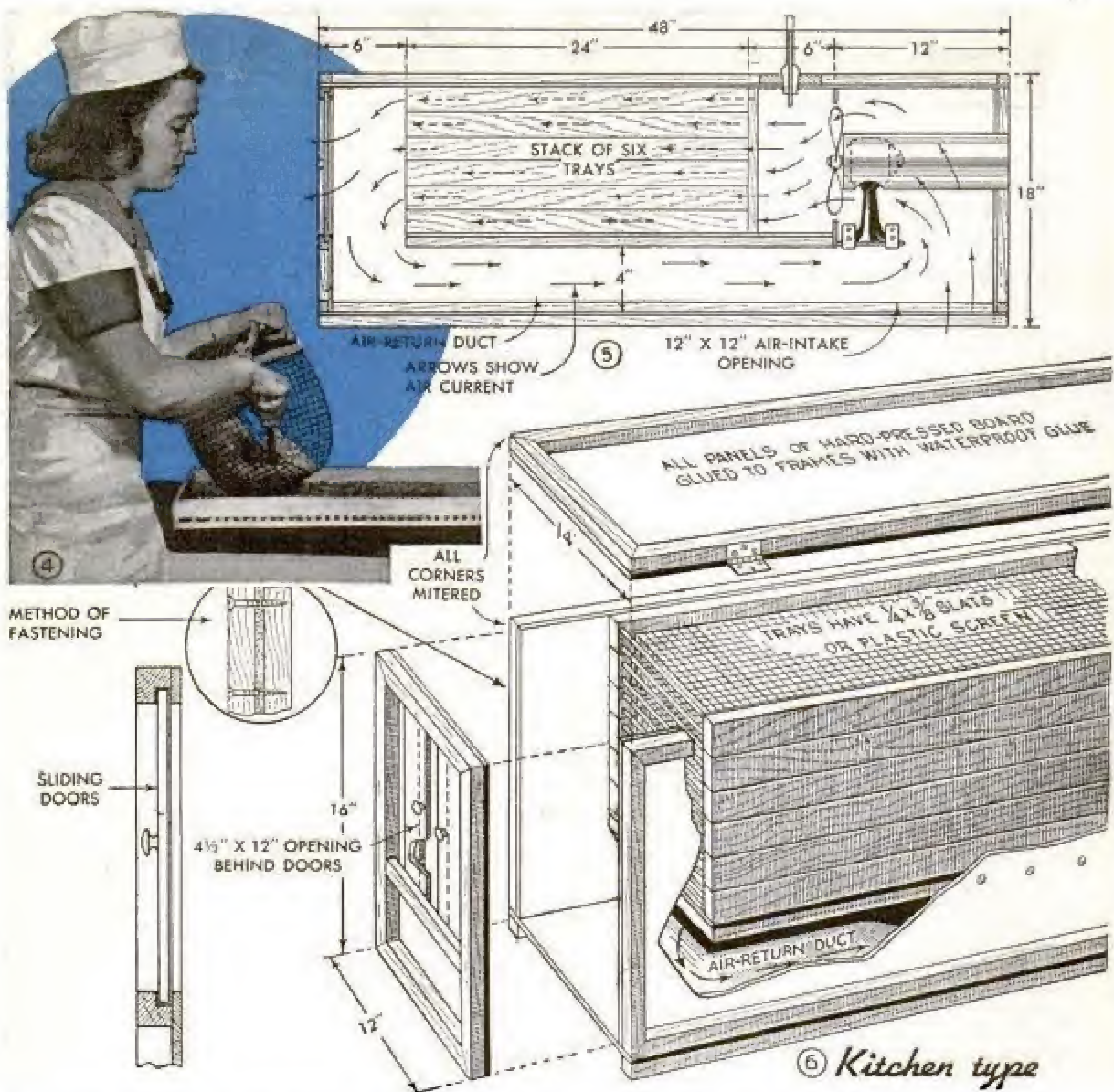


Above: Two senior 4-H Agricultural-Club girls prepare vegetables before blanching and dehydrating. **Below:** For steam blanching, food is placed in a homemade basket of hardware cloth, lined with cheese cloth, which is hung in a lidded container over boiling water. Blanching requires only a few minutes

control is impossible in home dehydration, a maximum temperature of 140 degrees F. is recommended for all fruits and vegetables except onions and garlic, which should be held below 130 degrees F. At these maximum temperatures no scorching will take place. After the moisture content of the food has been reduced to 8 to 12 percent, there will be a 4 to 6-hr. "curing" process, which further reduces the moisture content to 5 percent or less, in order to prevent vitamin, flavor, and texture losses during storage. To determine when vegetables are ready for curing, you remove a small amount of the material from the dehydrator after 5 or 6 hrs., allow it to cool for a few minutes, then apply a bending and twisting test. If the edges, let us say of a piece of carrot, will snap, but the center part will bend slightly before breaking, it can be assumed that the moisture content has been reduced to 8 to 12 percent. At this point curing can start. When the moisture content is reduced to 5 percent, vegetables will be hard and brittle, lacking any rubbery quality. Vegetables will keep better at 1 or 2 percent moisture content than at 5 percent. They cannot be damaged by continued drying. Consequently, it is better to be on the safe side and run the dehydrator a few hours longer.

When dry, vegetables must be stored in moistureproof containers or they will absorb moisture from the atmosphere. Cool, dark storage is an added factor in the pres-

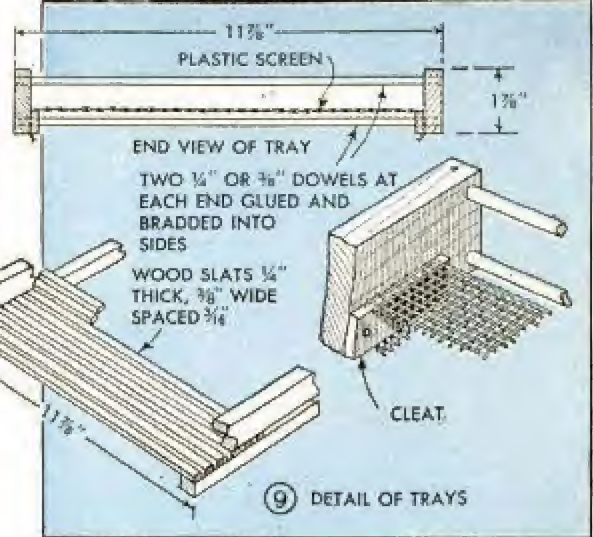
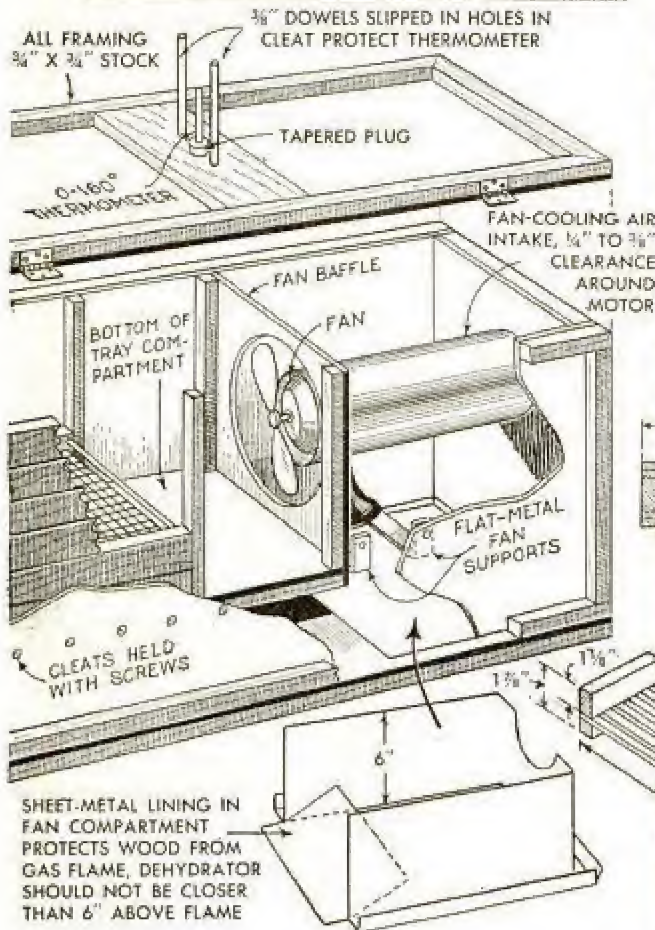
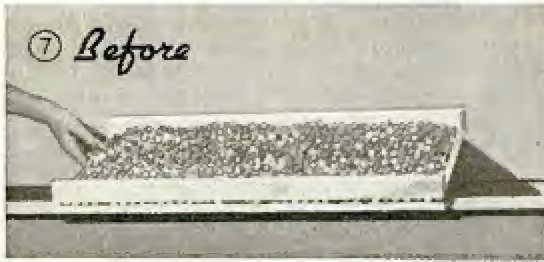




ervation of vitamins, color and flavor. Glass fruit jars, jelly jars, press-top tin cans, or similar containers with tight-fitting lids, can be used. Transfer the dried, warm material to the containers, put the lids on securely and then dip the top of the container in melted paraffin to assure a complete seal. It is best to use small containers, so that the contents will be consumed within a few days, since opening the can permits absorption of moisture from the air. Remember that a single quart of dried carrots will make from 25 to 30 normal servings. See Fig. 1. A tray loaded with diced carrots before and after dehydration is shown in Figs. 7 and 8.

The two dehydrators described in this article have forced-air draft, air recirculation, temperature and humidity control. Both have been tested thoroughly; if properly operated they will turn out a product

comparable to commercially dried foods and will dehydrate them with speed almost equal to commercial processes. They are economical to operate, can be made of scrap material and are provided with an ordinary electric fan or with an old automobile fan driven by a small motor. A second-hand vacuum sweeper of fairly large size and carefully cleaned, can be used. Whether you build the small or large unit will depend upon the amount of vegetables or fruit available for processing, on the needs of the family, and also on the size of motor and fan available as well as the capacity of the heat source and operating space. Both units are designed so they can be placed over a gas or smokeless oil burner, a kitchen oven or a room heater as a heat source. However, it is possible, but more expensive to use a bank of electric lamps or electric heater units totaling



about 2,200 watts as a heat source for the small unit. If an electric heat source is used, one must be careful not to overload the house circuit beyond its rated capacity.

The small or "kitchen" unit, shown in Figs. 5, 6 and 12 will hold 12 lbs. of vegetables, such as carrots, beets, or sweet-corn kernels at one loading. The larger unit shown in Figs. 10 and 11, is designed for use on farms where considerable quantities of produce are available at one time, and where large amounts must be preserved for winter use. It is designed so that one or more tray sections can be hooked between the end sections. Each tray section has eight trays and will hold 18 lbs. of vegetables. Three such sections can be operated with a 12-in. house fan as the air source, but five or six sections will require an auto fan driven by a $\frac{1}{2}$ or $\frac{1}{4}$ -hp. motor. The large dehydrator requires more than

twice the heat needed by the small one, or about 20,000 to 22,000 B.T.U.'s per hr. for the first 2 or 3 hrs. of operation.

Owing to possible uneven distribution of the air currents passing through the tray section in either one of the two dehydrators, vegetables on one side or those on the upper or lower trays may dry faster than the rest. In case of such unequal drying, it will be necessary to experiment with some baffles to improve the distribution of the air. If the trouble cannot be stopped entirely in this way, you may have to transpose some of the trays while the food is drying to obtain the desired uniformity.

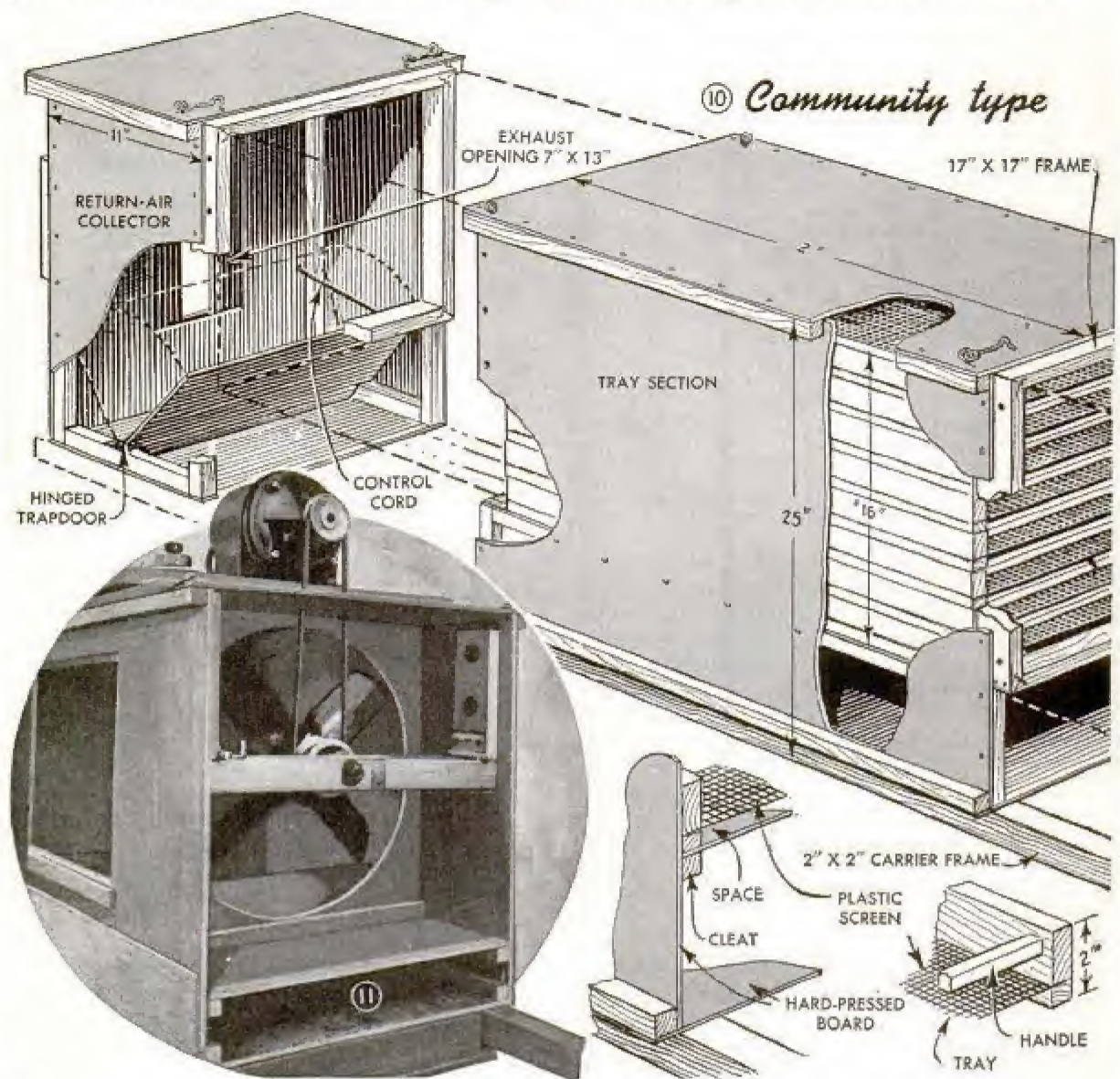
While $\frac{1}{4}$ -in. plywood was used in constructing the dehydrators, any other $\frac{1}{4}$ -in. wallboard or hard-pressed board may be used. However, if $\frac{1}{8}$ -in. board is used, allowance must be made for the change when following the dimensions as given in the

drawings, which were based on the use of $\frac{1}{4}$ -in. board. As wood and pressed board will burn, carelessness in placing the dehydrators over an open flame can cause a fire. Therefore, an open flame should not be closer than 6 in. to the bottom of the small dehydrator, and care should be taken to center the burner under the middle of the opening. Also, it is advisable to provide a sheet-metal flashing over the parts placed above a burner as detailed in Fig. 6. The burner under the large dehydrator, requiring a much greater flame, should be at least 18 to 24 in. below the bottom.

As the dehydrators should be constructed to be tight, it is best to glue and screw the frame pieces to the covering material. Trays can be made either of wood slats or plastic screen as shown in Fig. 9. Copper or galvanized-iron screen should not be used on account of the chemical reaction between the acids of fruits and some veg-

etables and the galvanizing or copper. For ease of construction, the tray sides may be made in two pieces between which wood slats are set $\frac{3}{16}$ in. apart to permit free movement of air yet prevent food from falling through. Even with this spacing, a cheese-cloth or muslin covering for tray bottoms is advisable when drying sweet corn, garden peas or diced vegetables. The slats should be glued in place, using waterproof glue. Nails alone will hold for a while but the wood will eventually draw away around them resulting in loose and unsatisfactory trays. If plastic screen is used, it should be attached with enough slack in order to allow the screen to draw up taut, which occurs while the dehydrator is being used. A couple of dowels across the ends of each tray will provide sufficient strength and rigidity.

An accurate thermometer having a range from 0 to 160 degrees F. is essential to check



the temperature. The thermometer can be placed in the lid of the small dehydrator or through the top of the large one immediately in front of the fan, where it will show the temperature of the heated air on its way to the loaded trays. The bulb should extend at least 1 in. below the lid. The thermometer is slipped through a drilled cork or wooden plug which fits a hole in a cleat provided across the lid as detailed in Fig. 6. A couple of dowels or other suitable guard should be located to protect the thermometer against breakage. A mounting should be fixed inside the dehydrator to hold the thermometer when the dehydrator is not in use.

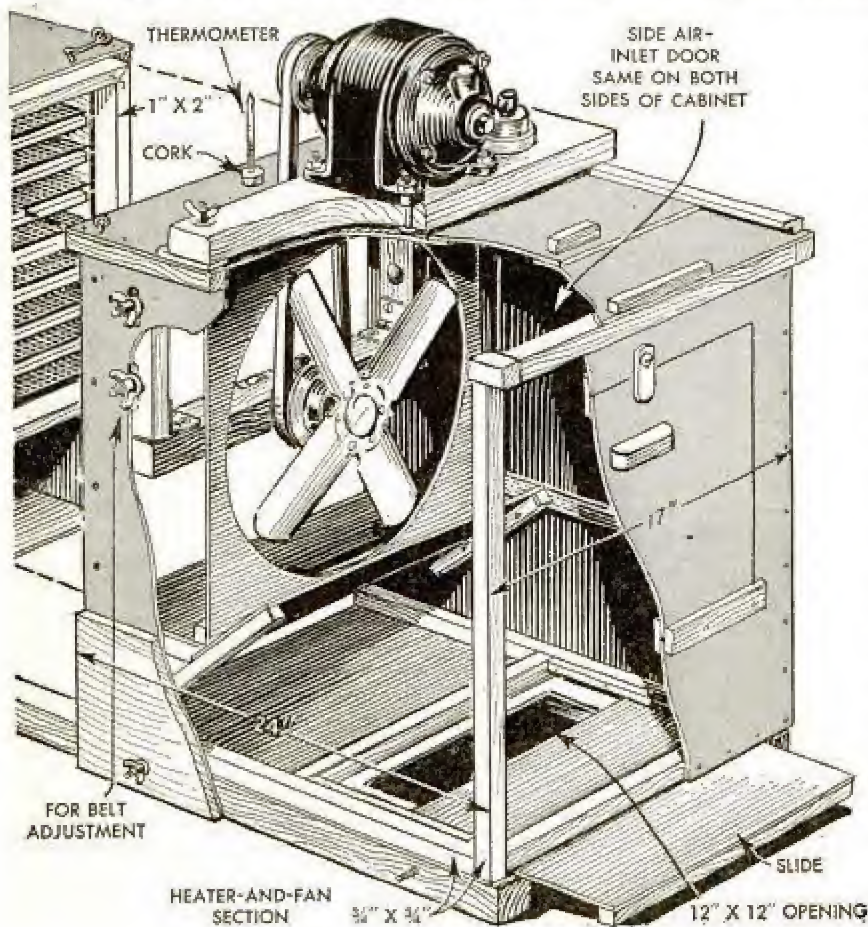
You will find that it takes from $\frac{1}{2}$ to $\frac{3}{4}$ hr. to warm up either the small or large dehydrator thoroughly. When the large dehydrator is being used with not over three tray sections, it will operate practically the same as the small one. When from four to six tray sections are in use, a different system, which is described later, should be used. After the temperature becomes stabilized, you will have to make slight adjustments the next 2 to 3 hrs. to maintain the initial 140-degree temperature while most of the moisture is driven out of the load. The exhaust doors should be open from 2 to 3 in. to permit the escape

of moisture. After this first period of rapid evaporation the temperature will gradually rise, indicating that the easily evaporated water has been carried away. You can leave the exhaust doors as they are and reduce the amount of heat to prevent a temperature rise over 140 degrees or you can control the temperature by opening the exhaust doors, which results in drawing in more cold air at the burner end. The balance between amount of heat and the opening in the exhaust doors will be found very sensitive.

At the end of $3\frac{1}{2}$ or 4 hrs. you open the dehydrator, remove the trays and disturb the material slightly, thus redistributing the load and breaking up any overloaded spots. If a variation in the drying rates of different trays is apparent, you should transpose them. After 5 or 6 hrs. the amount of moisture being carried away in the exhaust air will be slight so that the exhaust doors can be closed and the heat can be reduced. At the end of about 6 hrs. most vegetables will be reduced to 8 or 10 percent moisture content. Probably they will still be slightly rubbery in the center, but the edges should snap after cooling when given the twisting test. During the 4 to 6-hr. curing period which follows, the exhaust doors should be closed

entirely and the heat supply reduced. The machine will not require much attention during this period. If the same or similar vegetables are to be dried on say five successive days, the first, second, third or fourth day's load can be temporarily stored in tight containers. After the fifth day's load is ready for curing, the several days' run can be consolidated and finished at the same time. This will be found a great time and fuel saver, for it takes 4 or 5 hrs. to get rid of the last 3 or 4 percent of moisture.

If the large dehydrator is used with from four to six tray sections, start one tray section and let it have all of the hot air for $\frac{3}{4}$ or 1 hr., while the second tray section is being loaded. Then put the second tray section in place and at about the same interval add successive tray sections until all six are in use. When the fourth tray section is put in





(12) Air-exhaust doors on dehydrator being adjusted to maintain correct temperature

(13) PREPARATION GUIDE FOR VEGETABLE DEHYDRATION

Blanching without steam under pressure, as in a covered container, requires careful observation. Before removing vegetables from blanching container, they should appear translucent. The blanching container should not be overloaded and stirring may be necessary.

Kind	Preparation	Form	Steam Blanch (minutes)	Weight on trays per sq. ft.
Potatoes Irish (Use mealy types)	Peel, trim, remove eyes, and discolored spots	Slices $\frac{3}{16}$ " Dice $\frac{1}{8}$ " Strips $\frac{1}{4}$ " x $\frac{1}{2}$ " Wash after cutting	5 to 8	Slices $\frac{3}{4}$ lb. Dice 1 lb. Strips 1 lb.
	(or) Steam in skins	Press hot through $\frac{1}{8}$ " ricer onto trays	30	1 to 1 $\frac{1}{4}$ lb.
Potatoes Sweet (Use yams)	Wash, steam 10 min. and peel	Slices $\frac{1}{8}$ " Dice $\frac{1}{8}$ " Strips $\frac{1}{4}$ " x $\frac{1}{2}$ " Wash after cutting	8 to 10	1 lb.
	(or) Steam in skins and peel	Press hot through $\frac{1}{8}$ " ricer onto trays	30	1 lb.
Cabbage (Green kinds)	Remove old leaves and heavy leaf bases	Shred $\frac{1}{4}$ " thick. Blanch at once to preserve Vitamin C	4 to 6	$\frac{1}{2}$ lb., or less if too deep on trays
Carrots (Highly colored varieties)	Trim top to below green center. Scrape or peel	Slice $\frac{1}{8}$ " Dice $\frac{1}{8}$ " Strips $\frac{1}{4}$ " x 1"	8 to 10	$\frac{3}{4}$ to 1 lb. 1 to 1 $\frac{1}{4}$ lb. 1 lb.
Onions ("Strong" varieties)	Remove tops, root base and brown outer layers	Slice $\frac{1}{8}$ to $3/16$ " Keep from breaking by careful handling	None	1 lb.
Beets	Trim tops 1" above beet and roots 2" below. Pre-cook, then trim and peel	Slice $\frac{1}{8}$ " Dice $\frac{1}{4}$ "	30	1 lb.
Rutabagas (Yellow kinds)	Wash, pre-cook in steam, peel and trim	Slice $\frac{1}{8}$ " Dice $\frac{1}{8}$ " Strips $\frac{1}{4}$ " x $\frac{1}{2}$ "	30 to 40	1 lb.
Sweet Corn	Clean, trim and blanch on cob	Cut kernels after blanch	15	$\frac{3}{4}$ to 1 lb.
Greens	Wash, sort out old, damaged or discolored leaves. Remove stems of chard. Trimming loss will be heavy	Cut with sharp knife into $\frac{1}{2}$ " strips across leaf	4	$\frac{1}{2}$ lb.
Green Beans	Clean, sort and string. Remove over-mature pods	Shoestring $\frac{1}{4}$ to $3/16$ " Pieces $\frac{3}{4}$ to $\frac{1}{2}$ "	12 to 15	1 lb. $\frac{3}{4}$ lb.
	Banana Squash	Peel, clean out seeds, cut into 3" strips	Slice $\frac{1}{8}$ "	Place on trays to prevent solid areas $\frac{3}{4}$ lb.
		Peel, clean out seeds	$\frac{1}{4}$ x $\frac{1}{2}$ ", diced	1 lb.
Peas	Use only tender young peas.	Shelled	8 to 10	$\frac{3}{4}$ lb.

place, remove the return air collector and let all of the air escape. At the end of 5 or 6 hrs., the material in the section closest to the fan section should be ready for curing. Remove the section and move the others up toward the heater. Temporarily store the load in number one, reload it and put it on the end of the assembly line. This rotational operation can be continuous as long as desired. At the end of the run when the last section or two are finishing their 6-hr. period, the return air collector can be replaced and recirculation used. All of the lots can be consolidated for curing. Recirculation is used during the curing period.

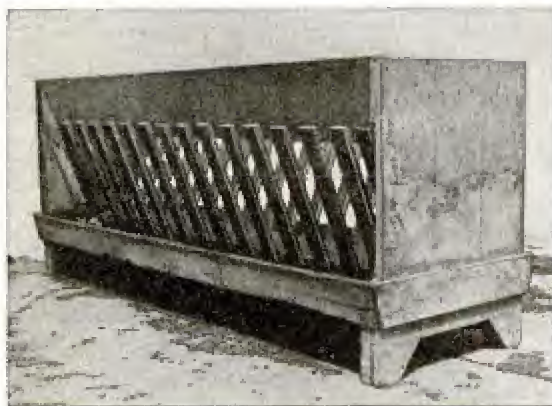
The recirculation feature of these dehydrators really comes into its own when drying fruits which are high in sugar content. If hot, dry air, causing rapid evaporation, is passed over fruits the surface moisture is evaporated so quickly that a glazed surface on the fruit will result. This is called "case-hardening." If this occurs the speed of further drying will be greatly reduced. Therefore, keep the

humidity of the air passing over the fruit relatively high by careful control of the amount of air exhausted. Continue the moist atmosphere for 5 or 6 hrs. Increase the opening of the exhaust doors after that time, but watch the fruit to prevent too rapid surface drying. Fruit will be rubbery when adequately dried—it will not become brittle. Remove several pieces of fruit from the dehydrator, let them stand 10 min. to cool thoroughly, then squeeze them into a ball. If the fruit is sufficiently dry, the pieces will separate when pressure is released. Surface of fruit will not be gummy or sticky.

When dried vegetables are prepared for the table, cover them with cold water for periods of 1 to 5 hrs., varying with the kind of food, and adding more water if necessary. Cook until tender in the same water used for soaking. Cooking time will be short as the blanching before dehydration has already partly cooked the food. Dried greens, such as beet tops, spinach, chard, and even cabbage require no soaking. Most vegetables will return to approximately 80 percent their original volume during rehydration and cooking.

Grain Trough on Hay Rack Saves Shattered Leaves

In feeding roughage to his sheep, one farmer noticed that many leaves that shattered from the hay rack dropped onto the ground and were wasted. To avoid this, he built grain troughs under the rack to extend beyond the lower edge as indicated. Any leaves that work through the sides of the rack fall into the trough where the sheep can reach them.



AUGUST, 1943

Colorful Pictures Appear Inlaid In Pearl and Metal



Sparkling as though they were inlaid in pearl, unusual decorative pictures can be made with the use of crumpled Cellophane, which is inserted between the glass and the cardboard back of a picture frame. Similar striking effects are possible by using bright metal foil, if it is available. If you can get an old spark coil of the kind used on model-T Fords, take it apart to obtain the foil. Best results are obtained by painting a picture such as a bird on the glass, using water colors or other paint that is not opaque. By placing the glass over a picture in a magazine, it is an easy matter to copy it. Do not add too much detail as this will detract instead of add to the effect desired. Then the background is painted opaque black. After the paint has dried, turn the glass around and lay it with the painted surface against crumpled Cellophane or tinfoil as shown, and assemble in the frame. Another way of obtaining unusual effects in pictures, is to select a colored picture and cut away the background. Then the picture is placed over the Cellophane and assembled in the frame, which gives a pleasing background effect. By placing a sheet of colored paper between the Cellophane and the cardboard back, backgrounds of various hues are possible.—R. W. Hadden, Palatine, Ill.

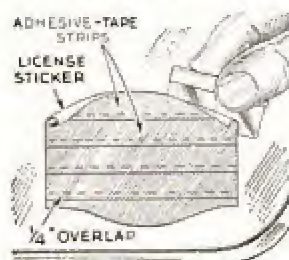
Ⓒ Mounting of tires on the new type safety rims is made easy by first moistening the tire beads with brake fluid or soapy water. Oil or grease should never be used as they will cause the rubber to rot rapidly.

Nonslip Surface on Straightedge Helps When Cutting Glass



Keeping a ruler or straightedge in place when scoring a large piece of glass with a cutter is a simple matter if strips of ordinary friction tape are applied to the underside of the straightedge. This provides a slightly tacky surface, which is effective in preventing slippage.

License Sticker Removed Easily From Broken Windshield



keep it from chipping. Let the strips of tape overlap the sticker about $\frac{1}{4}$ in. and use a safety-razor blade to work under the edges until the entire surface has been loosened. Rubber cement makes a good adhesive for fastening the license onto a new windshield.

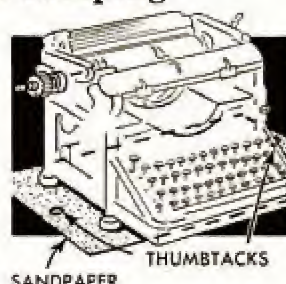
Painting Asbestos Shingles

Painting asbestos shingles can be done successfully if their surfaces are primed before applying the paint. A good priming coat for this purpose consists of a high-grade exterior house paint reduced with an equal volume of quick-drying spar varnish. When this has dried, the shingles are

given a coat of regular house paint. Another method that is recommended by a large manufacturer of asbestos shingles is to first prime them with a heavy brush coat of boiled linseed oil, brushing the oil in well. After the oil has dried thoroughly, a high-grade exterior house paint is applied.

Setting Typewriter on Sandpaper Prevents Creeping

Where a typewriter is used on a table temporarily and it is not advisable to anchor it with screws in the regular way, trouble is often encountered with the machine sliding or creeping



when in use. To overcome this nuisance without drilling holes in the table, just tack a sheet of sandpaper, rough side up, onto the table top and set the machine on it.

Neat Sign Has Raised Letters Cut From Old Linoleum



You don't need to be an artist to make a neat, raised-letter sign of the type shown. Just cut strips from a piece of discarded linoleum to form the desired block letters,

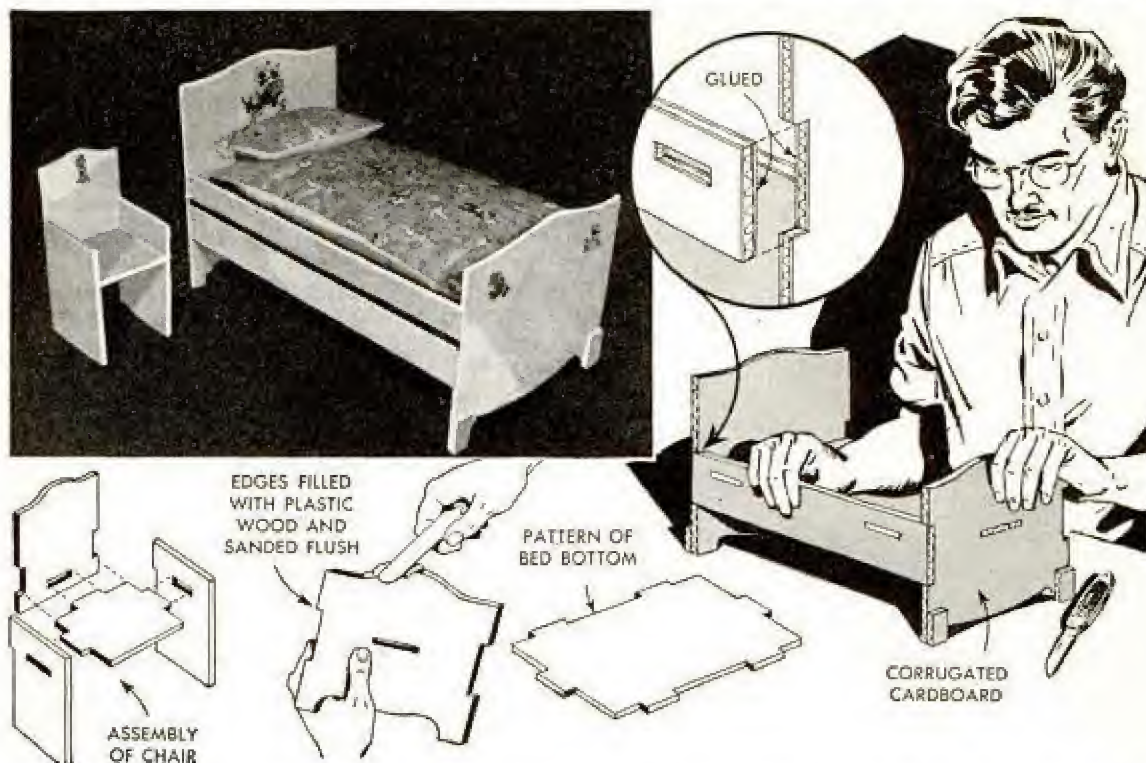
paint these a bright color and then tack them on a suitable board. When mounted on a contrasting background, the sign presents a professional appearance and will last a long time if protected with several coats of waterproof varnish.

Oiled Tin Shears Cut Tar Paper Without Gumming

When you use tin shears to cut roll roofing, composition shingles or linoleum, first dip the blades in heavy oil. This prevents gumming and gives a clean cut without tearing or folding. Discarded crankcase oil in the heavier grades will do, but gear oil is even more effective as it stays in place longer.



Doll Furniture Made of Reinforced Cardboard



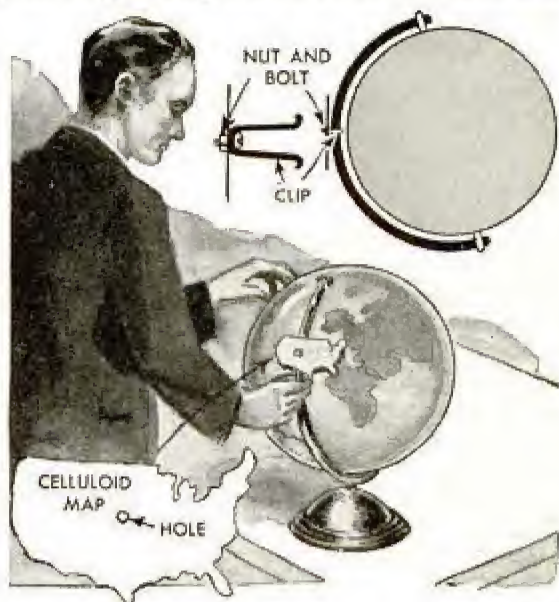
Lack of tools or inability to buy thin wood need not discourage you from making doll furniture for the tiny lady member of your family. You can make strong, neat pieces from corrugated cardboard, which can be cut with a sharp knife and reinforced with wood plastic or other crack filler. The doll bed shown is a good example of what can be done. After cutting the parts to shape and size, fill the edges of

each piece with wood plastic to a depth of about $\frac{1}{4}$ in., allow it to dry and then sand smooth. This makes the cardboard quite stiff yet springy enough to take a lot of abuse. Mortising and tenoning the parts and gluing all joints adds rigidity. Finish the furniture with paint. The first coat likely will be completely absorbed and, therefore, three coats will be necessary.

—Leslie P. Guest, Jersey City, N. J.

Visualizing Distances by Comparing Maps on World Globe

Like many other people I follow the progress of the war on a global map, and in doing so I get a relative picture of the distances involved by comparing the map of the country in question with a cutout map of the United States made to the same scale. Thus it is easy to realize the distances between points in a strange land by comparing them with known distances between large cities or other points on the map of our own country. For example, it is seen instantly that the length of Mediterranean Sea is approximately equal to the width of the United States, while the magnitude of the island groups in the Pacific becomes evident. To facilitate using the map, which was cut from clear celluloid, I bolted it to a metal clip, which slips over the circular frame of the globe, allowing the map to be placed in any desired position.—H. G. Pack, San Mateo, Calif.



Take Care of

To keep your bike in tiptop shape and to avoid the need for hard-to-get replacements, it's most important that the tires be inflated correctly and all moving parts lubricated at regular intervals. Careful handling, as well as proper adjustment of the seat and handlebars, will make it last longer and ride much easier



By Edwin F. Whiteside

WHILE many of us regard a bicycle merely as a tubular frame fitted with two wheels, it really is a precision-built vehicle that requires regular attention just as your car does. Given this, it will last indefinitely and provide hundreds of miles of trouble-free transportation. For the greatest ease and enjoyment of riding, the saddle and handlebars must be adjusted to suit each individual, and for sake of appearance, the painted and plated parts should be cleaned and waxed at regular intervals.

Most cyclists will find it better to have a reputable repairman make the major repairs, but these can be kept at a minimum by regular inspection and cleaning, oiling and adjusting of the wheel bearings, crank

hanger, fork bearings, chain, pedals and other moving parts. The frequency of these inspections depends largely on the amount the bike is ridden. Every 200 to 300 miles is about right, but if the bike is used in mud or in rain and snow, water and grit may work into the bearings, diluting the oil or grease and possibly causing rust, thus necessitating more frequent cleaning and oiling. It is a good idea to wipe all accessible parts of the bike dry after they become wet or muddy.

If you want to do your own repairing, or do a complete overhaul job, begin with the crank-hanger bearings, which are among the most important on the bike. The hanger is removed, after taking off the pedals, by unscrewing the lock nut and the cone on the left side.

The cone and ball bearings on the retainer are slipped off over the left crank, after which the whole unit can be slipped out the right side. Notice particularly the way that the ball retainers face and the arrangement of the cones, washers and nuts. It is a good idea to lay these parts out in a row as they are removed, to avoid confusion when reassembling them. Soak each part in kerosene and use a brush if necessary to remove every trace of caked grease and dirt, as in Fig. 2. Each piece should be wiped dry before assembling in the hanger, after which the bearings should be well oiled and adjusted, by means of the left-hand cone.

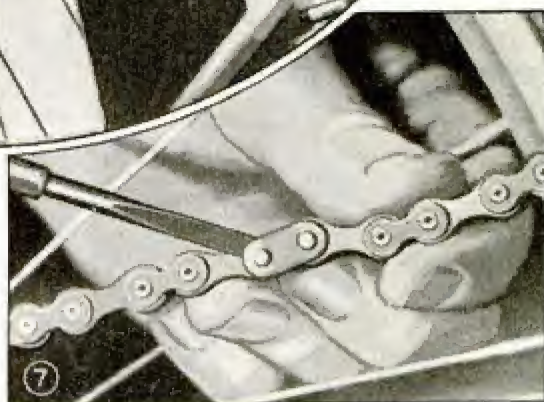
Next, check the pedals. One of the most common causes of pedal trouble is failure to keep them tightened in the crank eye. As an aid to effortless riding, the pedal

your **BIKE**



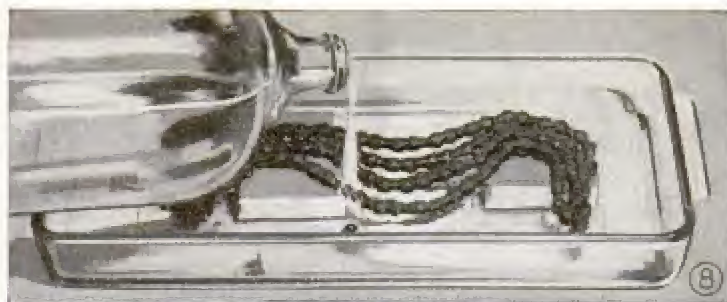
bearings must be kept clean and well lubricated. Avoid laying the bike on its side on the ground, which allows dirt and grit to work into the pedal bearings.

Like a car, any misalignment of the wheels will cause rapid wear of the tires. Therefore, be sure to keep the axle nuts tight on both wheels, Fig. 1. If they loosen, the bearing cones may tighten and ruin the bearings and likely necessitate expensive repairs. To test the running ease of a wheel, lift the bike off the ground and place the tire valve at the top as in Fig. 4. If the wheel is well lubricated and the cones are adjusted properly, the weight of the valve will cause it to turn. In removing the rear wheel, note the arrangement of the chain adjusters and be sure to detach the arm of the coaster brake. The wheel bearings are cleaned the same as those of the crank hanger and also adjusted the same way. The adjusting cone should be on the left side of both wheels. It is not



always necessary to remove the wheels completely. If they are not in bad shape, the cones can be loosened and kerosene squirted into the bearings while rotating the wheel, Fig. 5. This will flush out the grease and grit, after which the bearings can be adjusted and oiled.

The wheels are kept true and properly aligned between the forks by adjusting the spokes. Any broken ones should be replaced immediately, as their absence will allow the wheel to warp. The wheels can be centered in the forks by adjusting the



cones and the axle nuts. The chain-adjustment screws, Fig. 3, will aid in truing the rear wheel.

It is seldom necessary to remove the front fork bearings under the handlebars. If they are flushed out with kerosene after loosening the cones, and then adjusted and oiled properly, they will not need further attention for some time. If it is necessary to remove them, run the bolt in the center of the handlebars out an inch or so and tap it with a hammer as in Fig. 6. This will remove the handlebars from the fork,

which then can be taken from the frame by unscrewing the nut and cone on top. These bearings, and others too, can be packed with vaseline or a good grade of grease, before they are reassembled. For an all-around lubricant, a good grade of machine oil, such as SAE 20 motor oil, is recommended.

Being exposed to the weather at all times, the chain must be cleaned frequently and oiled properly to give maximum service. It is seldom necessary to remove the rear wheel to take off the chain, which usually has at least one "snap link" which can be removed by prying off one side with a screw driver as shown in Fig. 7, allowing the chain to come apart. The best way to clean a chain is to lay it on a couple of wood blocks in a shallow pan, pour in enough kerosene to cover it, Fig. 8, and rock the pan for a few minutes. Then allow it to stand for several hours until the grit washed out by the kerosene settles to the bottom of the pan. Following this, the chain should be given a similar bath in good medium-weight lubricating oil and each link tested to see that it works freely.

In replacing the chain, adjust the rear wheel by means of the chain-adjusting screws. If the chain is too tight, pedaling will be stiff and difficult. If it is too loose, backlash interferes with smooth pedaling. Check the chain tension by setting the right pedal firmly in braking position and placing the edge of a yardstick across the top of the pedal and the rear-wheel sprockets, as in Fig. 9. The chain should sag about $\frac{1}{4}$ in. below the edge of the yardstick. Make sure that both sprockets are aligned. For keeping the chain lubricated, a drop of oil should be placed on each end of each pin occasionally and the outside of the chain rubbed with stick graphite.

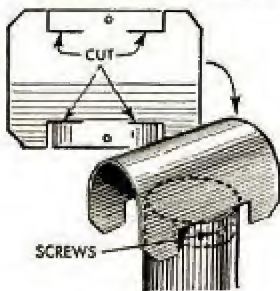
Nothing promotes easy riding and the greatest physical benefit from a bike more

than proper adjustment of the seat and handlebars. When the seat is adjusted to fit the rider, there will be a slight bend at the knee when the foot is placed on the pedal at its lowest point. The adjustment is made by raising or lowering the seat so that when the leg is placed straight down the heel will rest lightly on the pedal when it is at its lowest point, Fig. 10. When the ball of the foot is placed on the pedal after this adjustment, the proper bend in the knee will result. Always ride with the ball of the foot on the pedal, as in Fig. 11. The tip of the saddle should be just back of a line drawn straight up from the cranks when they are in a vertical position, or so that the rider feels he can exert the greatest power on the pedals just after they leave dead center at the top until just before they reach dead center at the bottom. Adjust the handlebars so that you are in a comfortable position when the hands are on them, and so that you lean just slightly forward, but not enough that you have to lean on them for support.

Tires should be kept inflated to the correct pressure. If no figures are given on the sidewalls, keep lightweight tires inflated to 50 lbs. and balloon tires to 22 lbs. The tubes of wire-bead tires can be patched just as an auto tube. When remounting wire-bead tires, make sure that the tube is not pinched and that the tire is properly seated on the rim. Never use a tool to mount these tires, as it may break or injure the bead. Single-tube tires must be cemented firmly to the rims, with rim cement and allowed to dry thoroughly.

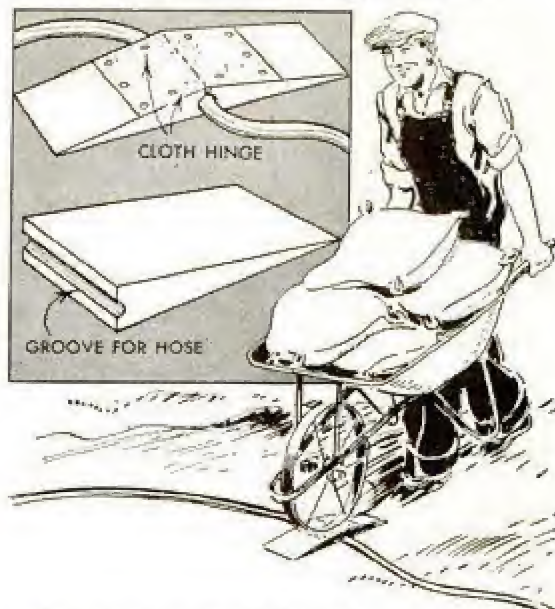
The average rider should not attempt to repair the coaster brake. It is rather a complicated device and should be repaired and adjusted by an experienced bicycle repairman. A good brake, properly adjusted, should stop the bike within 10 ft. when you are traveling at normal speeds. Avoid jamming the brake on suddenly except in an emergency. It will give good braking action over a long period if pressure is applied gradually.

One-Piece Metal Chimney Cap



Called upon to make a chimney cap in a hurry, a tinsmith cut one from a single piece of sheet metal as shown. The metal was curved the short way and the sections were bent into arcs to fit snugly into the chimney where it was held by a couple of sheet-metal screws.

Simple 'Bridge' for Wheelbarrow Over Hose or Pipe Lines



On construction jobs where it is necessary to push loaded wheelbarrows over garden hose or pipe lines, this portable "bridge" will protect the hose and provide a smooth crossing. Two wedge-shaped blocks are cut from scrap lumber, and the thick ends grooved lengthwise to accommodate the hose. A strip of canvas hinges the two blocks together so they can be folded when not in use.

Radiator Grill Is Straightened With Crowbar and S-Hook

The use of a large S-hook and crowbar as shown is a help in pulling out and straightening radiator grills that have been damaged. Remove the chrome trim strips and then pull the metal into approximate shape, after which it is given its final form by dinging.

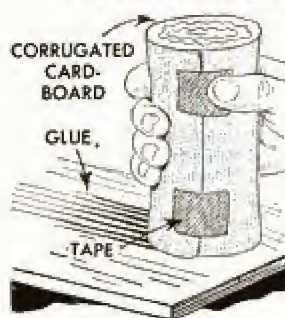


Spring on Pole Retrieves Boards From Deep Cistern



A simple and practical retriever for recovering small boards from a deep cistern was assembled quickly by one home owner who found it necessary to "fish out" parts of an old platform. The arrangement consists of an old auto-cushion spring which is fastened near the end of a long fishing pole with heavy cord or baling wire as shown. In use, the floating boards were pushed against the cistern wall, wedged in the coils of the spring and lifted out.

Glue Spread Over Large Areas With Fountain-Type Brush



tubes which will carry glue from each dipping and spread it evenly over the area.

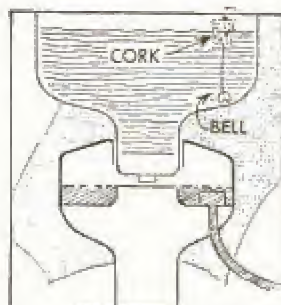
Giving Weathered Appearance To Articles of New Wood

The stained and weathered appearance of driftwood can be produced on new wood by treating it with a medium strong solution of ferrous sulphate. This is followed with a stain consisting of gray-green paint

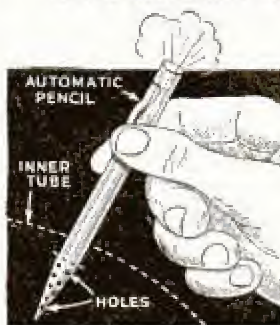
reduced with turpentine, after which spar varnish thinned with turpentine is applied. The turpentine is used in the proportion of about 1 qt. to each gallon of varnish.

Bell in Tank of Kerosene Stove Warns When Fuel Is Low

If you have ever had the tank on your kerosene stove become empty while cooking a meal, you can avoid this by using this simple device, which gives a warning before the tank is empty. The device consists of a small bell suspended with a cork that floats on the fuel. When the oil is low, the bell strikes against the bottom of the tank as the fuel bubbles, making a noise that can be heard clearly.



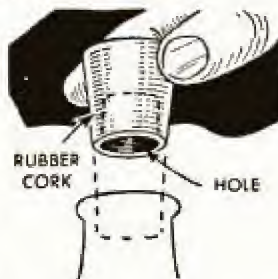
Automatic Pencil Serves as Tool To Deflate Punctured Tubes



After locating the hole, a punctured inner tube can be deflated quickly by forcing the barrel of an automatic pencil into the hole. Deflating capacity of the pencil is greatly increased by drilling tiny

Hole Drilled in Rubber Stopper Makes It More Flexible

When a number of glass bottles in a laboratory were broken by students, one instructor traced the trouble to rubber stoppers, which were often difficult to insert and remove. To correct this without purchasing smaller stoppers or larger bottles, he merely drilled a hole in the bottom of each stopper to provide flexibility without damaging the sealing properties of the stoppers.



Novel BAR-B-Q accessories

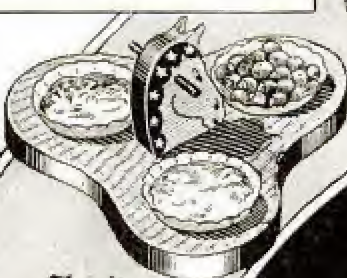
Easily fashioned from wood, these gay bar-becue accessories will add a colorful note to your outdoor entertaining. The rope-bound palette-type tray is ideal for individual service, and the triple server will take care of tid-bits. Two small jigsawed chefs glued to a base and carrying two long dowels provide a holder that takes six buns for making sandwiches. Lastly there is a holder for potato chips. Resembling a miniature magazine basket, the holder has two carrying handles



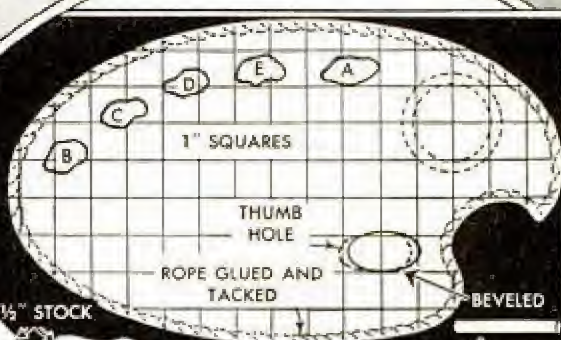
ROPE HOLDS GLASS IN PLACE

Individual tray

COLOR KEY
A—WHITE D—RED
B—GREEN E—BLUE
C—YELLOW



Triple server



BEVELED



Bun holder

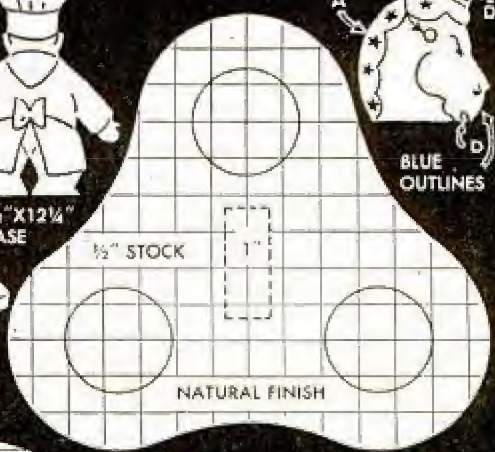
Potato-chip holder



BLUE OUTLINES

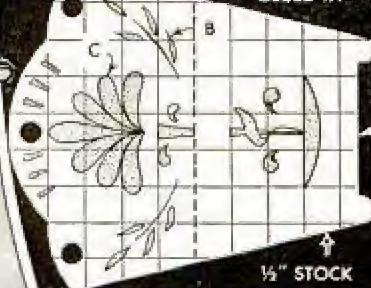
1/2" STOCK

1/4" X 11 1/4" DOWELS GLUED IN

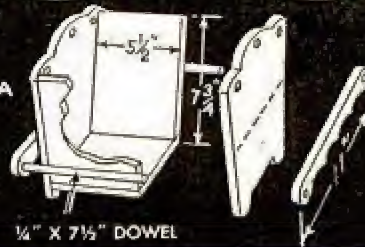


1/2" STOCK

NATURAL FINISH



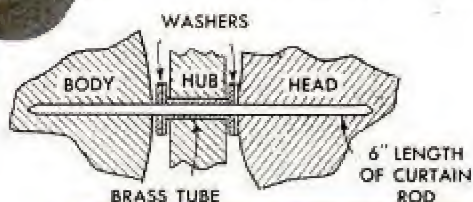
1/2" STOCK



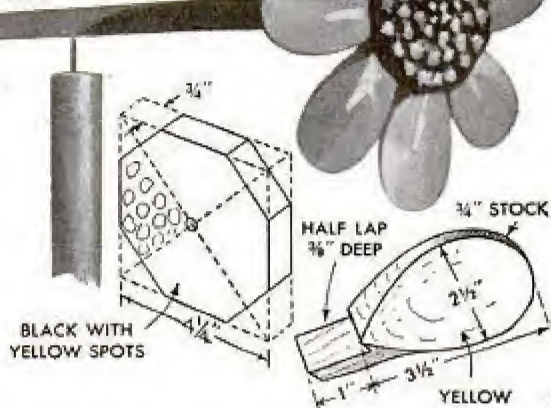
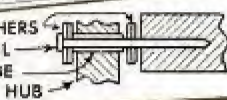
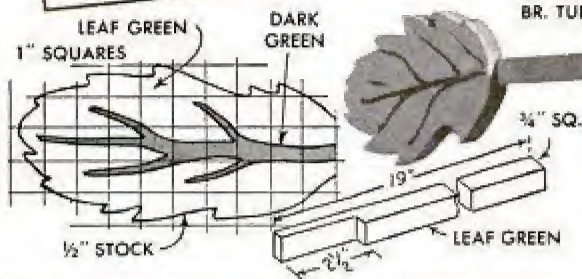
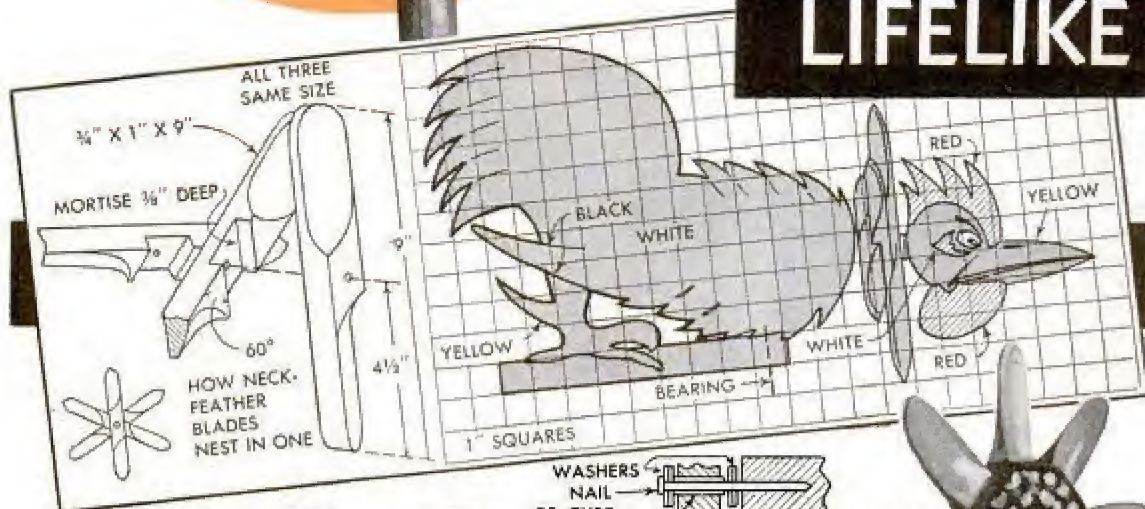
1/4" X 7 1/2" DOWEL



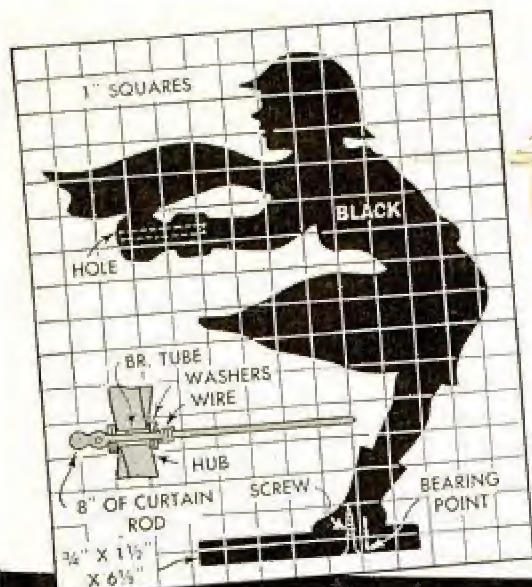
With bristling "neck feathers" and fighting pose, this animated old rooster attracts attention as a typical barnyard ruffian. A whirling six-blade propeller simulates the neck feathers. It rotates on a length of curtain rod, which also connects the head to the body. A metal tube provides a propeller bearing and four washers take care of the thrust. Paint the body white accentuated by a few black brush strokes. For the head, use a red comb and a yellow beak



LIFELIKE

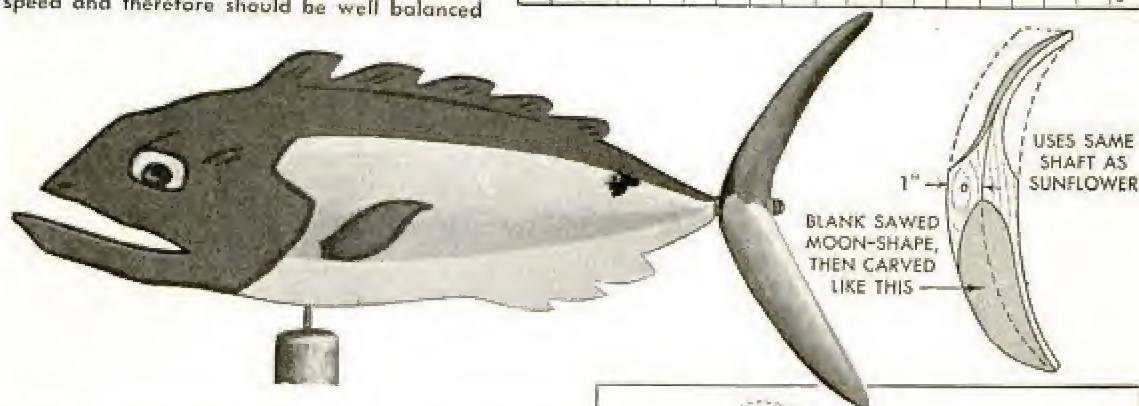
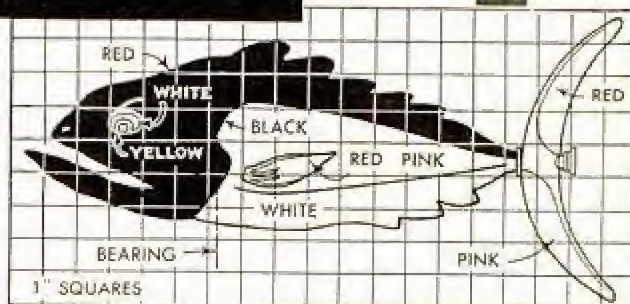


Eight propeller blades forming the petals of this sunflower produce a very realistic effect when it rotates. The flower is built up by attaching the petals to a hub with brads and waterproof glue. This windmill develops high speed and has gyroscopic tendencies, so be sure it is well put together and balanced. The pivot bearing is located at the fulcrum so a sudden gust will have less tendency to whip it around

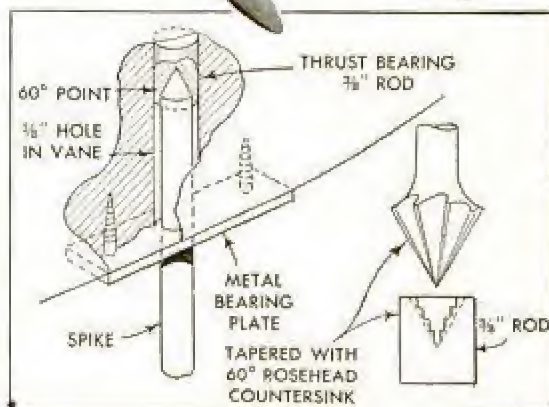


WEATHER VANES

Hanging onto her umbrella, which is almost blown inside-out, this little maid is typically posed. The figure and propeller point away from the wind instead of into it as is the case with the other models. For the figure, select a piece of wood free from checks, knots and pitch pockets. A base is glued and screwed to the feet to provide adequate support for the bearing. The propeller which simulates an umbrella is broad and flat, spins at a high speed and therefore should be well balanced



A savage, hard-fighting game fish, this red snapper with a rotating tail produces a lifelike appearance. The body is cut from $\frac{3}{4}$ -in. stock and is about 6 by 16 in. in size, while the tail can be whittled out of a 1 by 3 by 9-in. block. A large nail and a length of brass tubing make an ideal axle and sleeve bearing for the propeller. Washers take up the end thrust and torque when the fish turns suddenly in a gust of wind. The cutaway drawing at the right details a simple pivot bearing suitable for all four vanes. It consists of a thrust bearing having a conical hole formed in one end and forced up into a hole bored in the edge of the vane to take the pointed end of a spike which is held centered in the hole by a plate

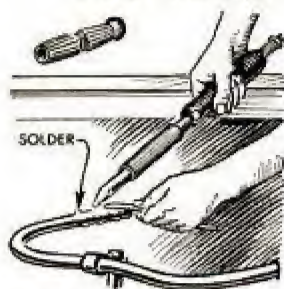


Slipping of Ladder Against Pole Prevented With Hose Clamps



Difficulty of preventing a ladder from slipping sidewise when placed against a pole may be overcome quite easily simply by fastening a pair of hose clamps onto the top rung. The clamps should be placed so that the projecting ends extend at the angle indicated.

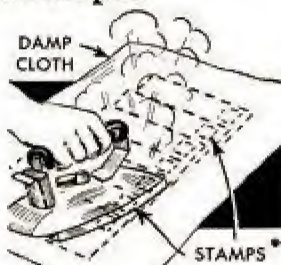
Worn Grip on Bicycle Handlebar Held Snugly With Solder



After the rubber hand grips of a bicycle have stretched so that they slip off the handlebars easily, the diameter of the handlebars can be enlarged with solder so that the grips will fit tightly. Clean the metal so that the solder will adhere and apply it in small drops.

Flatiron Loosens Moist Stamps From Envelopes

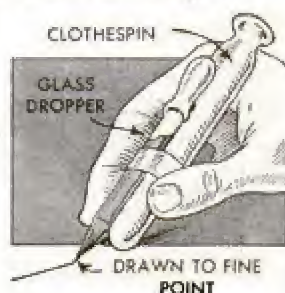
Collectors and others who wish to remove stamps from a quantity of old envelopes in a hurry and without damage can do the job easily by steaming them



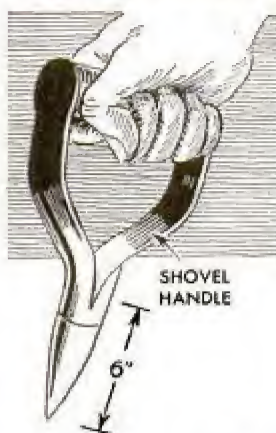
with a damp cloth and a flatiron. Spread the envelopes on a table and cover them with the cloth, then run the iron slowly over the cloth. This should be removed gradually as each stamp is removed to retain the moisture in the remainder of the envelopes.

Medicine Dropper on Clothespin Makes Good Paint Striper

If your hand is not steady enough to paint fine stripes on models or toys, you can use the illustrated striping tool with greater confidence. It consists of a glass medicine dropper, the point of which is heated and drawn to produce a fine line, and a clothespin which serves as a rest and guide. The dropper is fastened to the pin with tape.



Shovel Handle Serves as Dibble

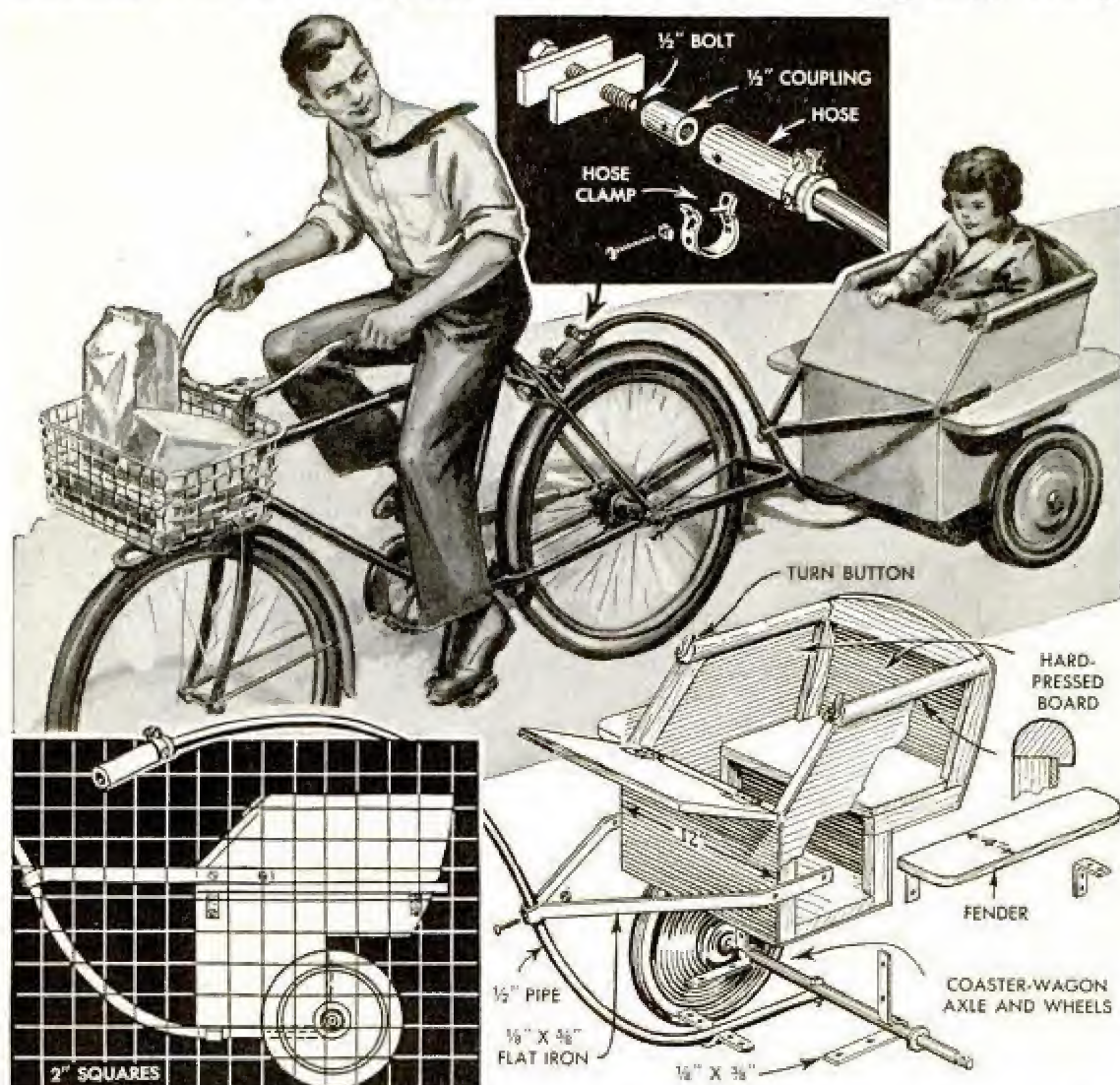


Needing a dibble longer and larger in diameter than those ordinarily furnished, a gardener made one by cutting a shovel handle to the desired length and then sharpening the cut end to a point. In addition to being of a larger diameter, the handle affords a better grip.

Car Hand Brake Applied Easily

If you have difficulty in setting the hand brake of your car because the lever does not give sufficient leverage, try the following method of setting it: As the hand and service brakes on many cars use the same brake shoes, it is possible to set the hand brake easily by depressing the brake pedal first and then pulling back on the hand-brake lever. When releasing the hand brake reverse the procedure, applying pressure to the brake pedal and then releasing the hand-brake lever. Depressing the brake pedal before setting the hand brake also builds up pressure in the hydraulic system and thus avoids drawing air into the system, which is possible when the hand brake is applied alone.

Child Rides Bicycle Trailer on Shopping Trip



Your little brother or sister will enjoy riding in this trailer, which also is useful if your mother occasionally uses the bicycle for a shopping trip when no one is at home to mind the youngster. Besides this, the trailer will be handy for hauling equipment on your weekend camping trips. Old coaster wheels and an axle serve as a chassis for the trailer, which has a body of thin plywood or hard-pressed board panels assembled on a light framework. The towbar consists of $\frac{1}{2}$ -in. pipe or seamless tubing. The novel hitch permits universal action without jerking or rattling, and can be made of standard parts as indicated in the upper detail. A short length of garden hose is slipped over the end of the towbar. Then a $\frac{1}{2}$ -in. pipe coupling and two pieces of bar iron are threaded onto a studbolt to clamp onto the rear fork of the bicycle as indicated, after which the other end of the hose is slipped over the coupling. The hose

is held in place by small bolts and hose clamps. Note that the upper half of the trailer dash is hinged and opens forward for easy entrance. When closed, the dash is retained by a pair of turn buttons attached to the ends of the arm rests as indicated.

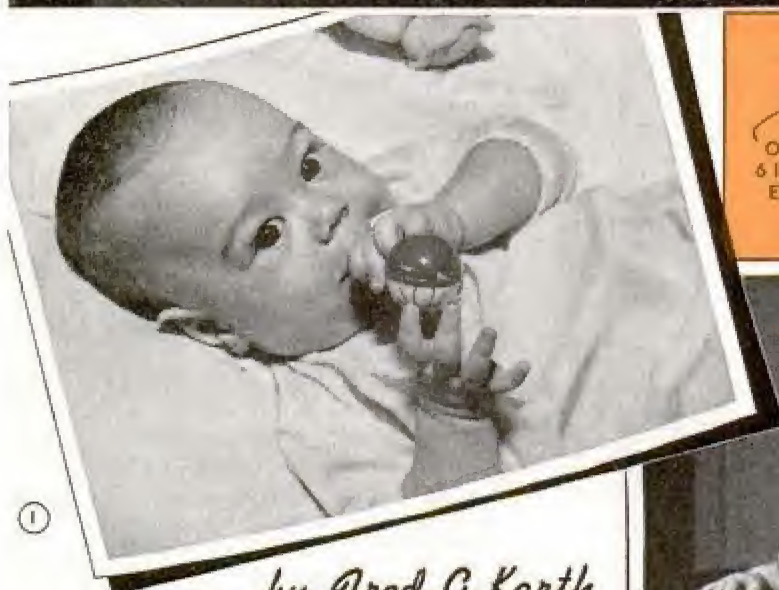
Ice Pick Cultivates Potted Plant

Although the growth and thrift of a potted fern depends on it being repotted at regular intervals, the work may be postponed by loosening the earth with an ice pick. This is inserted through the vent hole and rotated.





INDOOR PORTRAITS *Simplified*

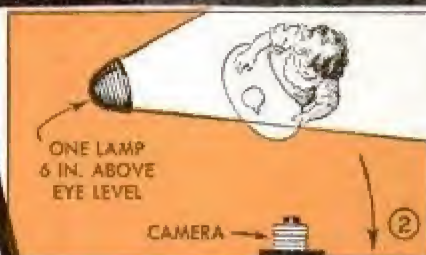


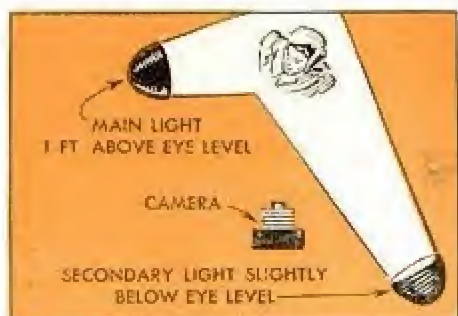
①

by Fred G. Korth

YOU should be able to make interesting portraits indoors of anybody willing to pose, using almost any camera, even a box camera, which is in good condition. Start by using only one type of film, one negative developer, one printing paper and one print developer for all of your work so that you can concentrate on posing and lighting.

For portraits, like most other kinds of pictures, type B panchromatic film is recom-

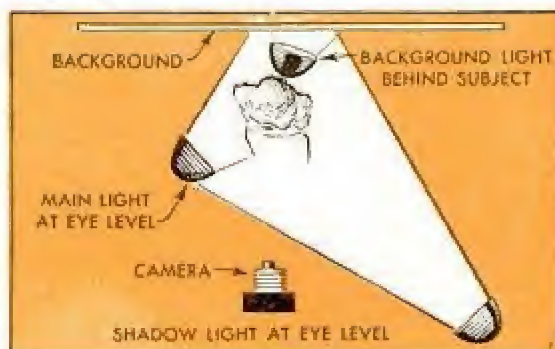


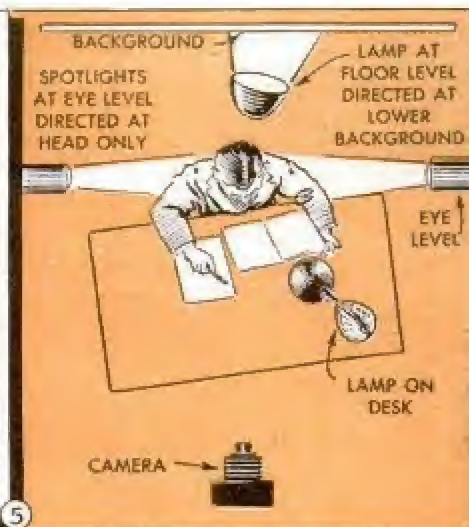


mended. It is sensitive to all colors including red, and it should be developed by the time-and-temperature method in total darkness—without any safelight. How fast a film to use depends on the amount of light available and on the speed of the lens. For a box camera and normal lights you should use the fastest film available. Panchromatic films are classified into types A, B and C. Some slower films are of type A, only slightly sensitive to red. More of the medium and high-speed films are of type B, which is average red-sensitive. The majority of the speed films are of type C, suited for portraiture only in blue daylight. These are too sensitive to flesh tones. They render faces and hands chalky white in artificial light. The faster the film, the shorter the exposure. Short exposures assure a more natural facial expression and eliminate the trouble of getting blurs due to movement of the subject.

Assuming that you expose the film correctly and develop it as directed by the manufacturer, the only things to make or break the results are posing, expression and lighting. Posing and expression are not difficult with people you know well, because they feel at ease. However, always keep in mind that you don't want "passport" pictures and for this reason you want the subject not only to feel at ease but also to look at ease. A severe, straight-on look into the camera with the shoulders horizontally across the negative should be avoided. If the picture has to be taken head-on, have the shoulders slant one way or the other or have the head lean toward one side. Hands, likewise, must be considered. The best solution is to give them something to do as in Figs. 1, 5 and 6. Hands may be left out of closeups as in Fig. 3, or they may be shaded as in Fig. 4.

For a background, wallpaper having a pronounced design that will show behind the subject should be avoided. If only papered walls are available, the one with the





least apparent design should be used. A background having light or dark lines caused by doors, windows and pictures, that show behind the image of the subject is also highly objectionable. For common portraiture of head and shoulders, a white wall at least 6 ft. behind the subject is best. The farther away you keep the back-

ground, the easier it is to give it any tone value from white to black. By lighting the background you can make it white or light gray and by keeping all light away from it, you can make it black. A good way to get a black background at night is to pose the subject a few feet in front of an open door to a dark, adjoining room. The frame of the door will serve to keep most of the light out of this room. The small amount of light entering it will be too far away to register on the film after being reflected by the interior. Fig. 4 demonstrates background illumination. Ordinarily the background must not be bright enough to make the face lose its outline but in a case like this one the background must be bright on the shadow side of the head and dark on the light side of the head for a pleasing outline and good contrast.

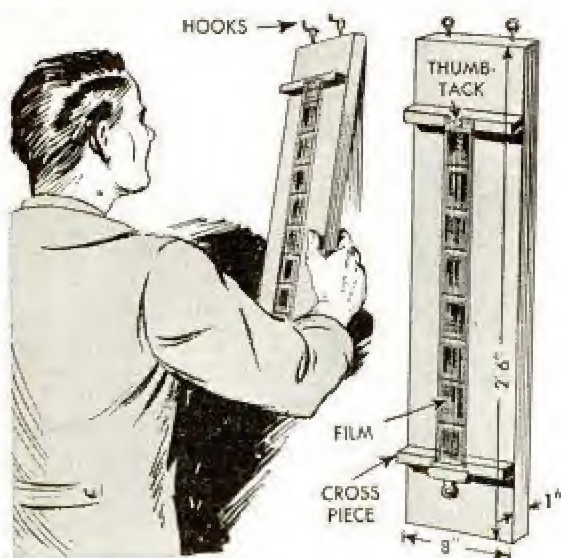
Proper lighting of the subject is of great importance in getting good portraits. You can use photoflood lamps, although ordinary house lamps can be used when photographing grownups. If you use one No. 2 photoflood in combination with one or two No. 1 photofloods, the larger one has to be moved farther away from the subject than the others so that the light will blend correctly. Using 100-watt lamps often is preferable to bright photofloods because the subject will not squint. Never use more lights than are necessary. One light is often much better than many—Figs. 1 and 2. Also, an open reflector is better for portrait lighting than a spotlight. If a spotlight is used, however, other lamps have to be added to blend with it. Unusual photos such as Figs. 4, 5 and 6, require unusual lighting, but simple, straightforward pictures with good likenesses require a

main light from the direction into which the subject is looking—Figs. 2 and 3. This light should be placed high enough to throw a little shadow under the chin, but low enough to light the eyes. It should be over enough to the side to render the cheek on the camera side a little darker than the other side. Never switch on several lights at once as you will lose control of the effect of each one; add only one light at a time as needed. Place all secondary lights far enough away from the subject to avoid cross shadows and to keep them from competing with the main illumination.

You will notice that small sketches near the photos show the approximate position of the lights and subject in relation to the camera position as well as information concerning the height of the lamps, which will be helpful in case you wish to experiment with photos along similar lines. In the sketches of Figs. 4 and 5, the backgrounds are placed relatively close to the subjects. In the actual arrangement it should be remembered that these should be 6 ft. behind the subjects.

Roll Film Is Mounted on Board For Washing and Drying

Easily assembled from scrap stock, this board holds roll film for both washing and drying. The over-all length of the board should be such that the ends will rest on the rim of a tray while the film is suspended in the water for washing. The two crosspieces are mounted to accommodate the size of film used. After the film comes out of the hypo, it is mounted on the board with thumbtacks for washing. At the end of the washing period, the bottom tacks are removed and a spring clip placed on the film for a weight. Then the board is hung on the wall while the film dries.



AUGUST, 1943

Mailing-Tube 'Snout' on Spotlight Concentrates the Beam



War-time shortages did not keep one photographer from having attachments for his spotlight. The "snout" shown here was made entirely of cardboard and serves its purpose of concentrating the light beam well. A 4½-in. length of mailing tube about 1½ in. in diameter was fastened in place with cellulose tape onto a square cardboard holder. The holder fits the attachment brackets of the spotlight. Screens or colored plates may be slipped back of the attachments for special effects.

Cardboard Strip Holds Paper Flat And Prevents Curling in Box

A strip of fairly heavy cardboard, folded as shown and placed under the lid of a box of sensitized paper, will keep the paper from curling and becoming difficult to handle. The folded card will spread and accommodate itself to the space between the cover and the paper and hold the sheets flat, regardless of how many have been removed from the box. For safety, a heavy rubber band should be kept around the box so that the strip will not force up the lid and allow light to enter.



Photo Solutions Cooled or Heated In Convenient Dipping Basket



Photography fans who do not have dark-rooms with running water can control the temperature of their solutions by making and using this dipping basket. Solutions to be used are poured into quart jars, the jars placed in the basket and all lowered at the same time into a sink or washtub containing water of the proper temperature. The basket shown was assembled of flat iron, but a similar one could be made of wood strips and coated with waterproof paint.

Tongs in Overflow of Washbowl Keep Small Prints Out

Small prints can be washed thoroughly in a washbowl, by plugging the drain and adjusting the flow of water so it runs out



through the overflow. The prints, however, are sometimes washed into the overflow and clog it. This can be prevented by sticking one side of a pair of print tongs in the opening, as shown.

Ladder Is an Emergency Tripod For Taking High-Angle Shots

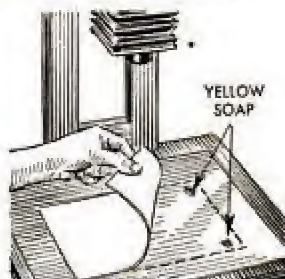
A stepladder provides a good emergency tripod for taking photos in which the camera must be raised to a considerable height. The camera can be rested on one of the steps or a hole can be drilled in the step



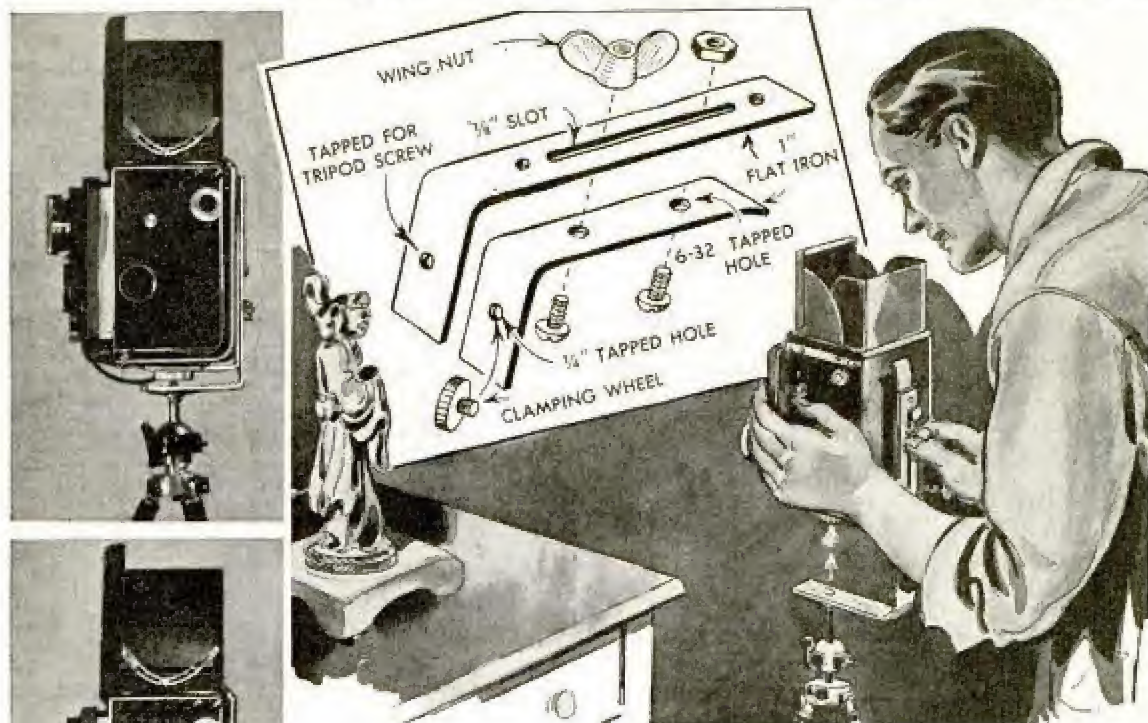
through which a thumbscrew is inserted to engage the mount of the camera. For ease in adjusting the camera at different angles, a tilting head may be used, as shown.—J. Modroch, Danbury, Conn.

Dabs of Laundry Soap on Easel Hold Enlarging Paper Flat

Sheets of enlarging paper can be held flat on the easel for making borderless enlargements by placing a dab of soap under each corner of the paper. Yellow laundry soap is the best to use, as it is slightly more sticky than other types. At the same time, the soap can be wiped off easily with a damp cloth, leaving the easel clean.



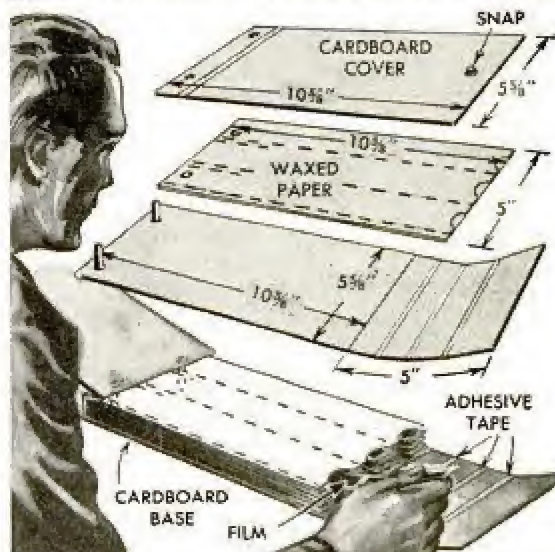
Parallax Compensator for Twin-Lens Camera



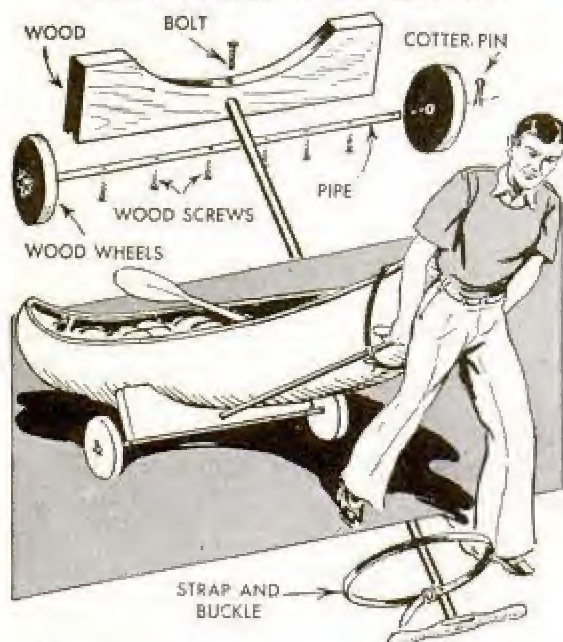
Due to the difference in parallax between the upper focusing lens and the taking lens of a twin-lens reflex camera, difficulty often is experienced when attempting extreme close-up work with supplementary lenses. To overcome this, some way of shifting the camera after focusing must be provided so that the taking lens supplants the focusing lens. A simple method of doing this is to use a couple of lengths of flat iron as shown. One is attached to the camera by means of a small clamping wheel turned into the tripod-screw hole, and slides freely in a slot in the other one, which is fastened to the tripod with the regular tripod screw. In this way, the camera can be focused in its normal position and then raised until the taking lens occupies the position previously held by the focusing lens.

Homemade Album Holds Large Number of 35-mm. Films

Held together by two ledger binding posts between heavy cardboard covers, each page of this 35-mm. negative album holds three strips of film of six exposures each. A 1-in. section of the front cover, through which the binding posts pass, is hinged with adhesive tape, while the back cover has a hinged section at the front. This consists of three 1-in. sections and one 2-in. section, bound together with tape. Folded over the end of the album and snapped to the front cover, the flap thus formed protects the negatives from dust. The pages can be made from waxed paper, folded and stitched on a sewing machine, as shown, or waxed-paper envelopes of suitable size may be used. The holes in the covers and pages for the binding posts must be punched accurately to make a neat job.

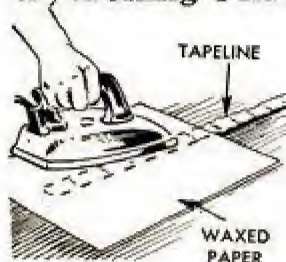


Handy Cart to Transport Canoe From Beach to Boathouse



Small enough to be carried in your canoe when taken apart, this light cart simplifies the problem of transporting a large canoe to and from the water. It consists of two wooden wheels mounted on a pipe axle which is flattened and drilled in the center for attaching screws. As shown, the support is cut to the same contour as the canoe bottom and it is also drilled to accommodate a lawnmower-type handle and locking bolt. Note that the canoe is prevented from slipping by a strap buckled around the handle, which, in some cases, may have to be bent down.

Wrinkled Tapeline Is Smoothed By Ironing Under Waxed Paper



When a dressmaker's tapeline becomes crumpled and wrinkled from long use, it is difficult to pull it smooth for accurate reading. However, if the tape is ironed

while covered with a sheet of waxed paper, the fabric will be smoothed and stiffened to make the tape almost like new again.

Portable Tub for Your Laundry From Old Washing Machine

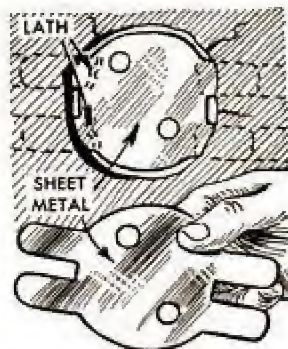
If you have an old washing machine that is no longer serviceable, it can be converted into a portable tub that will be handy

in the laundry room. To do this, take off all the mechanical parts and put back the screws that pass through the tub. A little white lead under the heads will help seal them against possible leakage. If a large opening is left in the tub where a part was removed, you can fit a plate of light metal over it and fasten it down with the original screws. In such cases, it may be necessary to use gaskets between the metal parts to prevent leakage.

—K. E. Soliday, Sapulpa, Okla.

Metal Backing Piece Helps Repair Hole in Plastered Wall

Patching over a round hole in a plastered wall where the lath have been cut away to admit a water pipe or drain often is difficult. But usually you can simplify the job by using a piece of sheet metal shaped as indicated. The projecting tabs on the metal are slipped carefully between the lath and plaster to hold the rounded portion in the opening. The rounded portion should be smaller than the opening so that some of the plaster will be forced beyond the metal edge to form a key.



Pencil Through Paper Clamps Keeps Book Open

Keeping the pages of a book open while following a formula is a simple matter if you use a couple of paper clamps and a pencil. The clamps are slipped over the top ends of the opened book, after which the pencil is slipped through the clamps as shown to prevent the book from closing.

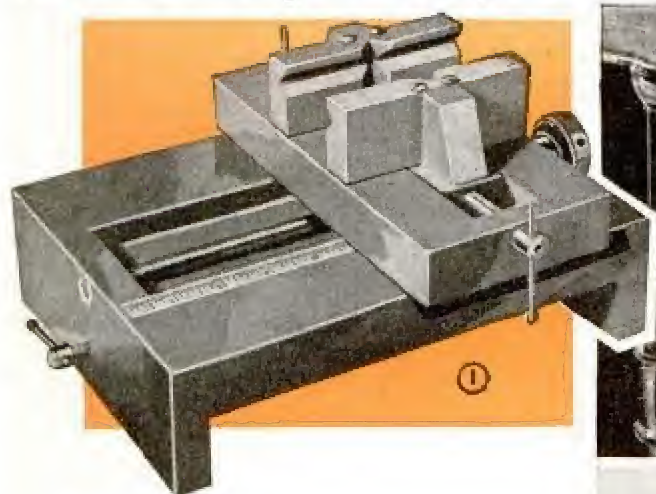
—Wm. Swallow, Brooklyn, N. Y.



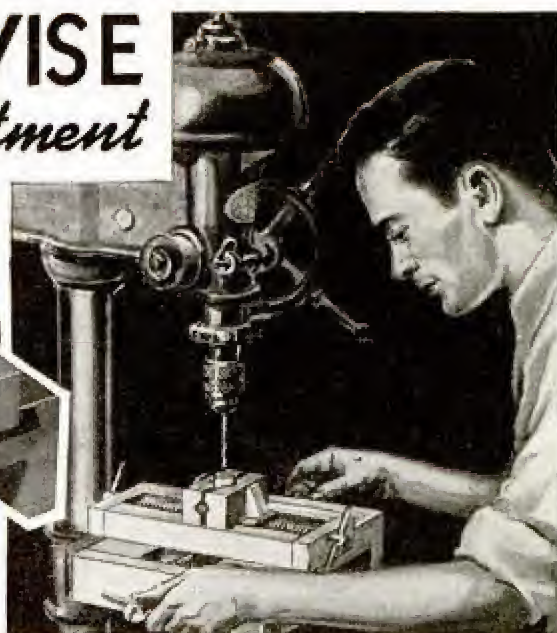


SHOP NOTES

DRILL-PRESS VISE *has cross-feed adjustment*

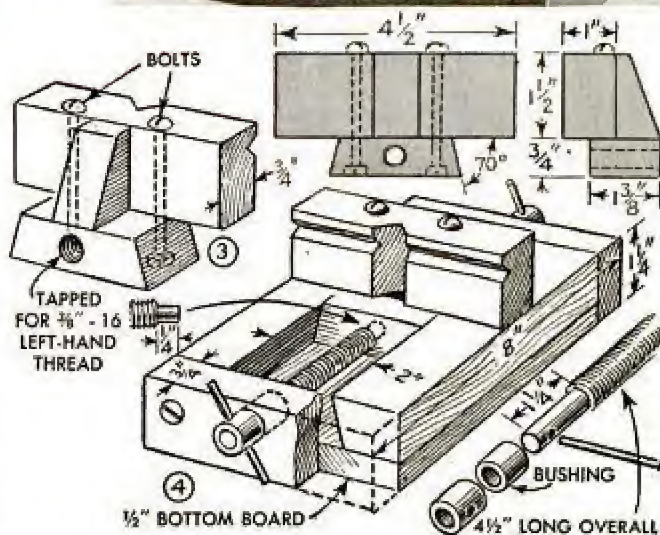


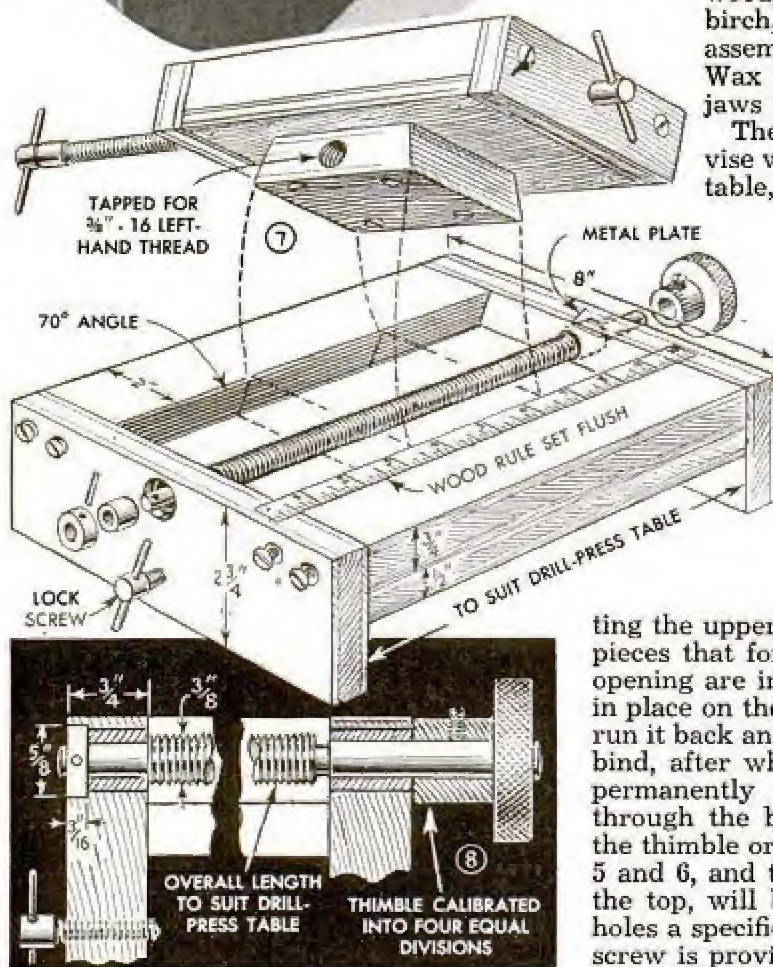
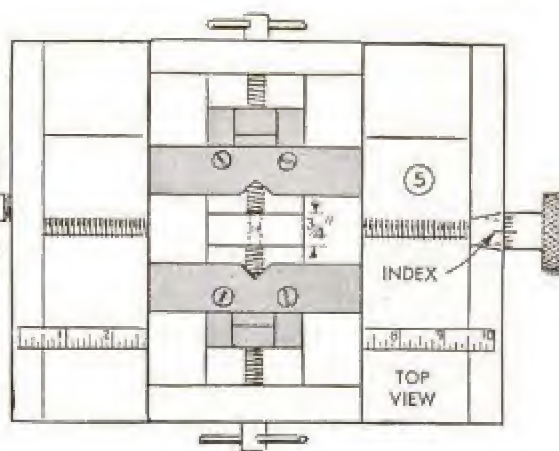
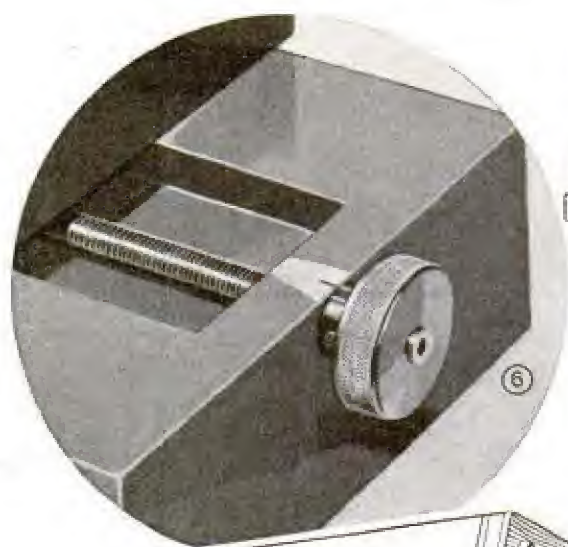
Works like compound rest on lathe carriage to give extremely sensitive and positive adjustment. Clamps securely to drill-press table, and is made almost entirely of wood



By Walter T. Warde

THE two-way, vernier adjustment of this excellent drill-press vise makes it especially useful whenever work must be centered with extreme accuracy. It is designed to straddle the table as shown in Fig. 2 and consequently must be made to fit the one on which it is to be used. Carriage and jaw screws of the original, Fig. 1, have left-hand threads so that the parts will travel forward, as on all machine tools, when the handwheel and thumb-screws are turned clockwise. However, if facilities are not at hand to cut left-hand threads, you can use a right-hand thread instead.





wood, therefore, such as maple or birch, should be used for this and assembled with glue and bolts. Wax on the ways will make the jaws work smoothly if they bind.

The base or lower part of the vise which fits over the drill-press table, is detailed in Fig. 7. This,

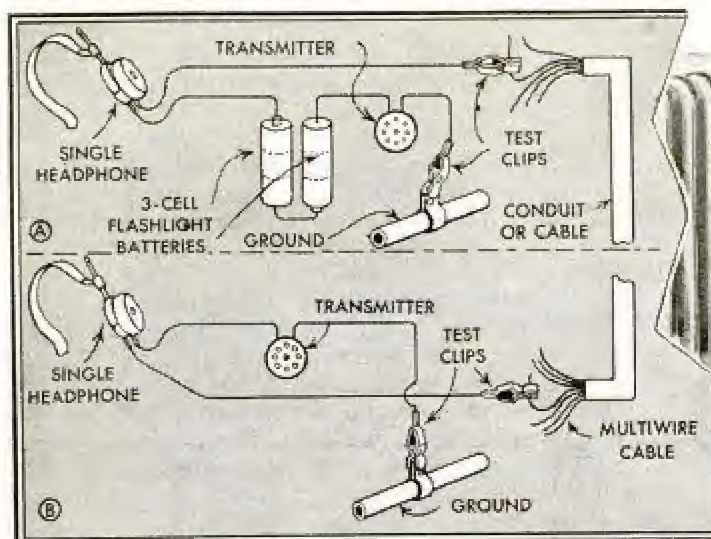
too has dovetail ways in which the upper unit travels back and forth on a threaded shaft passing through a tapped block attached to the underside. The cutaway view in Fig. 8 shows how bushings are fitted to carry the shouldered ends of the shaft and how it is held in place by a collar at one end and a knurled hand-wheel at the other. Best results will be had in fit-

ting the upper unit to the lower one if the pieces that form the sides of the dovetail opening are inserted after the vise unit is in place on the shaft. In this way, you can run it back and forth to see that it does not bind, after which the pieces are fastened permanently with screws driven up through the bottom. The calibrations on the thimble or hub of the handwheel, Figs. 5 and 6, and the wooden rule set flush in the top, will be found helpful in spacing holes a specified distance apart. A locking screw is provided on one side of the base for holding the latter in position on the table. The hole for this can be tapped directly in the wood or a nut can be embedded on the inside.

If you have been careful in fitting the joints accurately, several coats of gray enamel will make the vise look as if it were made of metal, especially if the wood is sanded well and end grain filled with a sealer. It is best to leave the dovetail ways free of paint unless sufficient clearance has been allowed between the sliding parts.

Fig. 3 shows how each vise jaw is made, while Fig. 4 details the frame and the dovetail ways in which the jaws travel. Collars fitted to the outer ends of the shouldered feed screws keep the opposite ends engaged in a block fitted midway between the ends as shown in the top view in Fig. 5. Note that the faces of the jaws are V-cut to hold round stock vertically as well as horizontally, and that the hole in each jaw for the shaft is tapped directly in the wood. Hard-

Tester to Check Circuits in Multi-Wire Cables



Electricians who install or repair telephones, annunciators, burglar alarms, etc., that are connected with multi-wire cables will find a set of these testers a timesaver in tracing the circuits through the cables. A set consists of two individual testers each having a single headphone, transmitter (carbon microphone), and two clips wired as shown. Tester A has two three-cell flashlight batteries or six $1\frac{1}{2}$ -volt single cells, connected in series between the transmitter and the headphone. In use, tester A is connected at the source of the cable. One of the clips is attached to a water pipe or, if the cable being tested is armored, the clip can be clamped to it. The other clip is fastened to one of the wires to be traced. Tester B at the other end of the cable is connected as shown—one clip to the ground and the other to the various wires individually until the voice of the workman using tester A can be heard. Each wire in the cable is checked in this way until all have been traced. The

batteries are taped together and can be carried in the pocket. If a chest support for the transmitter is not available, one can be made from a heavy piece of wire to fit around the neck or chest so that both hands are free. Care should be taken so that the attachment clips do not contact each other in order to avoid injury to the transmitter.

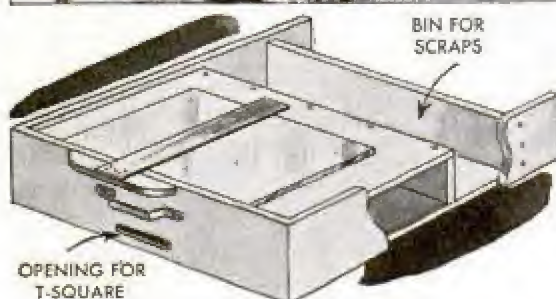
Lacquer Coating Protects Insulation on Car Ignition Wires

If the insulation breaks or peels off the high-tension ignition wires of your car, the efficiency of the motor will be reduced considerably. If it is impossible to replace these wires with new ones for some time, they should be protected against heat and grease, which rapidly deteriorate the insulation. To do this, give them a coat of clear lacquer. Before applying the lacquer, however, clean the wires of all grease by washing them with gasoline and allowing the wires to dry thoroughly.

☛ An old speedometer cable is effective for cleaning radiator overflow pipes.



Drawer Near Glass Bins in Store Provides Handy Cutting Table



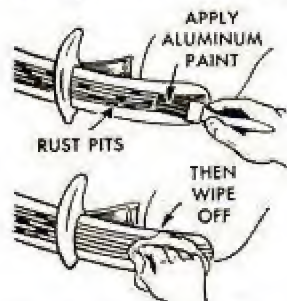
Installed near the glass storage bins in a small hardware store, this drawer was built especially to provide a convenient surface on which to measure and cut glass for customers desiring special sizes. A false bottom supports the glass so that the surface of it comes flush with the drawer top, making it possible to use a small T-square as a straightedge in cutting. To speed measuring, a cloth tape measure is glued on the front edge of the drawer. Note also the small bin for scrap pieces of glass at the back, and a slot in the drawer front to take the T-square when not in use.

—Opie Read, Jr., Chicago.

Rejuvenating Rusty Car Bumpers

Car bumpers pitted with rust spots can be rejuvenated in appearance by brushing a little aluminum paint into the pits. To do this, apply the paint with a fairly dry brush, coating a small area at a time and wiping off the excess paint immediately before it has a chance to adhere to the unpitted surface. This treatment lightens the color of the pits and blends them inconspicuously into the polished surface. It also helps prevent further rusting.

—J. Modroch, Danbury, Conn.



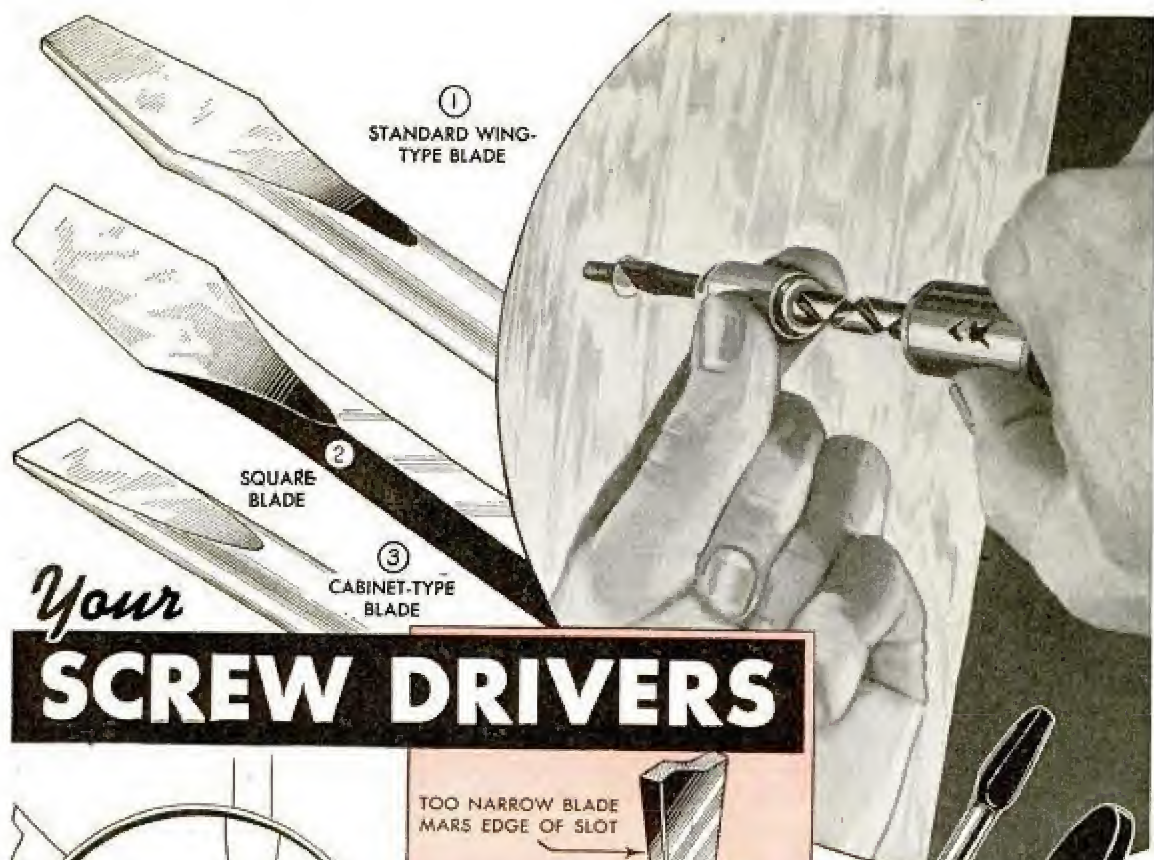
Selecting the Right Screw Driver To Suit the Job

Although few hand tools are used more universally than a screw driver, this simple tool often is misused and generally abused. Mutilated screw-head slots, broken screw shanks, marred work around a screw, inability to loosen and tighten a screw are results of using a screw driver of the wrong size or type, or one that has the blade tip ground incorrectly.

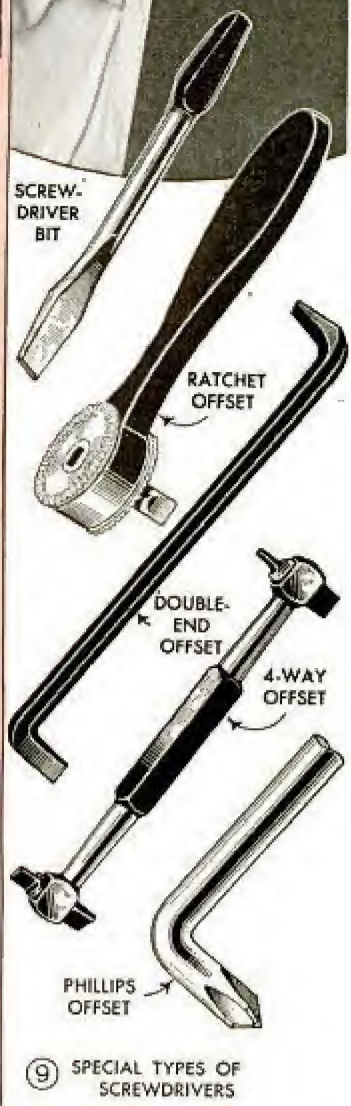
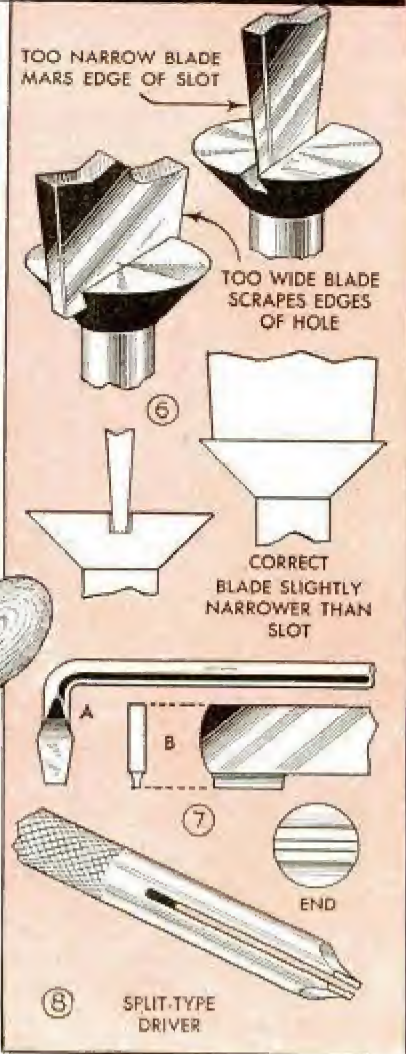
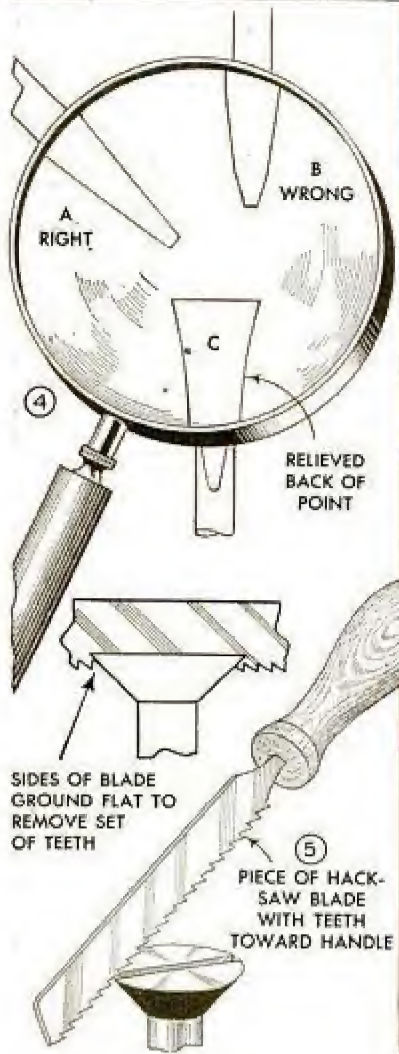
Like other widely used tools, there are several types of screw drivers, each designed for a special purpose. The three common types are shown in Figs. 1, 2 and 3. The wing-blade types are preferred for screws set flush with the surfaces, while the wingless or cabinet styles are used when screws are to be driven into counter-bored holes. But regardless of style no screw driver will handle a screw properly unless it is shaped and ground to fit the slot correctly. Detail A in the magnified view of Fig. 4 shows how a screw-driver blade should appear when ground for ordinary work, while detail B shows an incorrectly shaped blade—one that will slip out of a screw slot as soon as a little pressure is applied. For fine or delicate work, some mechanics prefer to relieve the blade back of the point as shown in detail C.

When selecting a driver for a job always use one having a blade a trifle narrower and thinner than the length and width of the screw slot as shown in the two lower details of Fig. 6. The two upper details show what happens if the blade is too narrow or too wide. It is always a good idea to have a 3-in. length of hacksaw blade, set into a small handle, for cleaning slightly misshaped screw slots or for reshaping those that have been slightly mutilated. Such a saw is shown in Fig. 5. The set of the teeth should be removed by grinding.

For screws that have been driven too tightly to remove with a straight-blade driver, the two types shown in Fig. 7 will do the job. The one in detail A is an ordinary screw driver bent at right angle near the tip, while the one in detail B is ground from flat steel. Both should be hardened before they are put into use. Fig. 8 shows a split type of driver that holds the screw for starting it in deeply counterbored holes or other hard-to-reach places. On jobs that require driving or loosening a large number of screws, much time can be saved by using a spiral ratchet screw driver like the one shown in the photo. Then there are the special types, some of which are shown in Fig. 9. These are used on jobs where straight-shank screw drivers are inconvenient or impossible to use.



Your SCREW DRIVERS



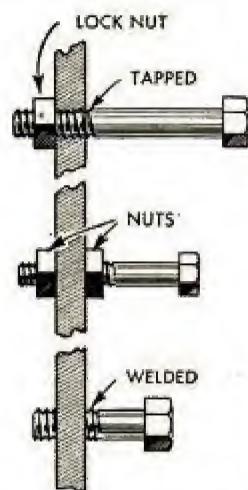
Bench Stops Support Can or Drum When Welding and Soldering



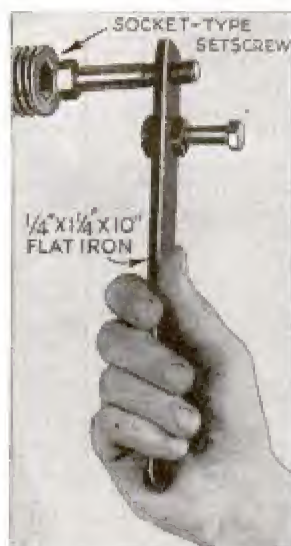
To hold drums, cans or cylinders of various sizes on his bench for welding or soldering, one mechanic has the bench fitted with stops which may be driven up to the desired height as occasion requires. The drums are rotated easily on the stops but are less likely to turn accidentally than they would be if supported by rollers.

Wrench for Socket-Type Screws Is Assembled Quickly

Finding it impossible to purchase a set of wrenches for screws having hexagon driving holes, one machine operator assembled improvised ones to serve the purpose. A piece of flat iron was first cut and drilled to accommodate several bolts hav-



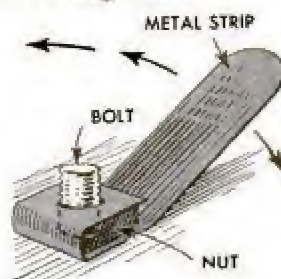
THREE METHODS FOR ANCHORING BOLTS



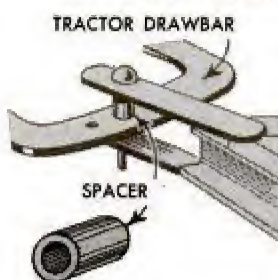
ing hexagon heads the same size as common driving holes in socket-type screws. The bolts were then anchored to the flat-iron handle according to size and particular work for which the wrench was intended. Three methods for anchoring bolts were found satisfactory and these are indicated in the drawing. One method makes use of two nuts, while another consists of tapping the handle, and the third involves welding.

Nut Placed in Folded Metal Strip Serves as a Wing Nut

In any work where a bolt is employed upon which the nut must be loosened or tightened frequently, and no thumb nut is at hand, a substitute may be made by drilling and bending a strip of tin or sheet metal to receive the square nut. The tin then serves as a self-contained wrench or handle for turning the nut easily.



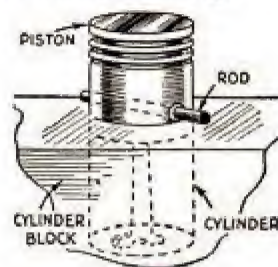
Pipe Spacer Prevents "Bucking" Of Trailer Hitch



One farmer prevented the hitch clevis of a heavy two-wheeled trailer from "bucking" when traveling loaded over uneven ground by inserting a spacer cut from iron pipe between the top half of the clevis and the tractor drawbar. The clevis pin passes through the spacer as shown. This arrangement allows free sidewise movement, yet prevents the pounding caused by up-and-down movement of the clevis.

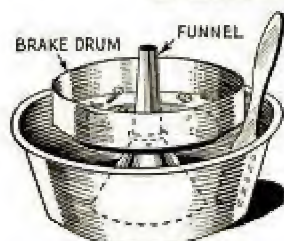
Installing New Piston Rings

When you have to put new rings on a piston that must be removed from the bottom of the motor block, just push the piston far enough through the top of the block so that a rod can be inserted through the wrist-pin bushings as shown. This will let the piston



rest on the surface of the block while installing the rings, after which the rod can be removed and the piston pushed down into the cylinder. If there is any chance of the connecting rod scoring the cylinder walls, wrap it with newspaper or cloth.

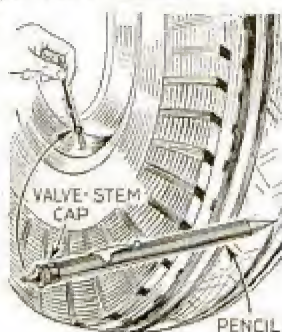
Tray for Washing Small Parts Is Self-Draining



In garages and other places where a pan is used for washing small parts in gasoline, a self-draining tray can be provided for the pan by inverting a funnel in it and slipping an old brake drum over the neck of the funnel. In use, the parts to be cleaned are placed in the drum and gasoline from the pan is applied to them with a small brush. In this way, the gasoline runs back into the pan, and the parts can be picked up easily.

Valve-Stem Cap Always at Hand When Kept on Pencil

To be sure that a valve-stem cap is always at hand for removing valve cores, one service-station attendant removed the eraser from the end of a pencil that he always carried in his pocket, and slipped the valve-stem cap over the end of the pencil. In some cases, it may be necessary to squeeze the cap a little so that it will fit tightly.



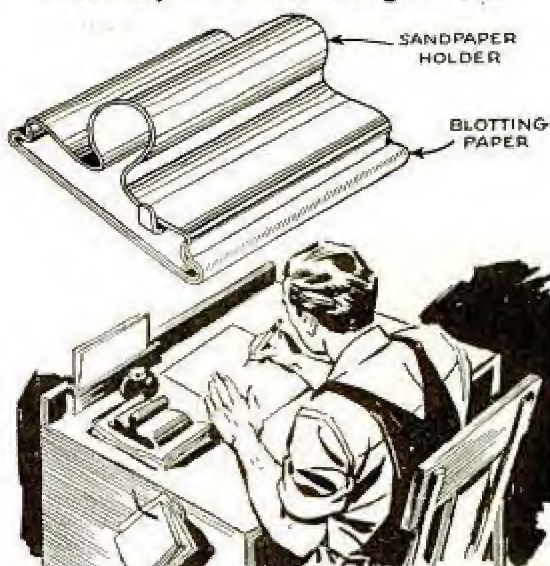
Hand Strap Improves Bee Smoker



Operating the bellows of a bee smoker with one hand while opening a hive with the other is not difficult if a hand strap is provided on the bellows of the smoker. In this way, the hand can be slipped through the looped strap to support the weight of the smoker while the bellows are operated with the fingers.

—A. S. Wurz, Jr., Rockyford, Alta., Can.

Blotters in a Sandpaper Holder Handy at Your Shop Desk

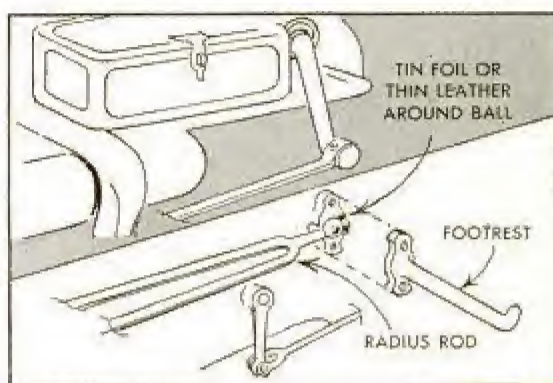


Where blotters are needed for continued use at shop and office desks, metal sanding blocks of the type shown make excellent holders for them. In this way, convenient handles are provided and the holders can be used for paperweights. Suitable blotting paper strips are cut from large desk-size sheets of blotting paper and kept on hand for replacements when the ones in use become saturated to a point where they no longer absorb excess ink.

Radius-Rod Shim for Tractor

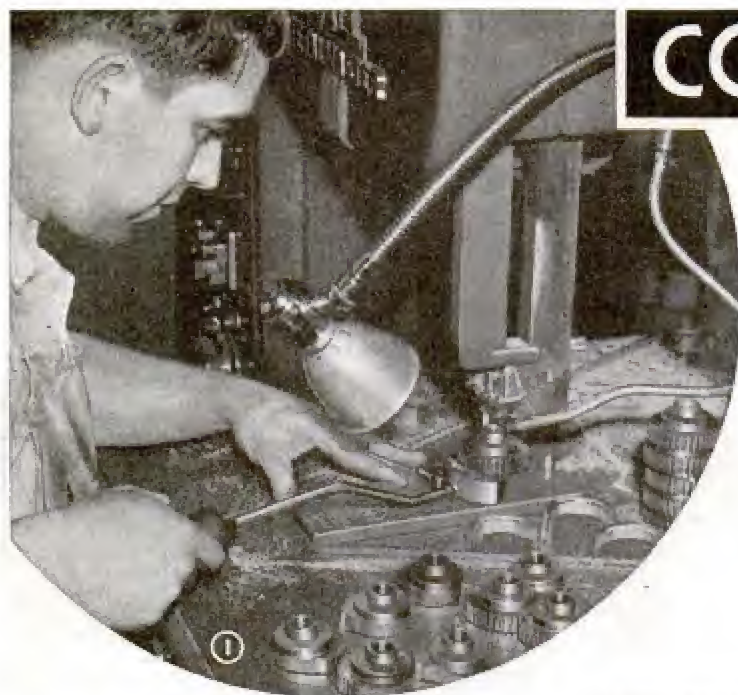
When a Ford tractor is used continuously over rough ground, wear on the ball sockets that hold the inner ends of the radius rods enlarges them to the point where there is considerable play in the adjustable front axle. To prevent this, one operator removed the outer half of the socket, which also forms the foot rest, and inserted a double thickness of tinfoil as indicated. Lacking tinfoil, thin leather will do. Avoid shimming too tightly as these parts are not lubricated.

—W. C. Lammey, Sandwich, Ill.



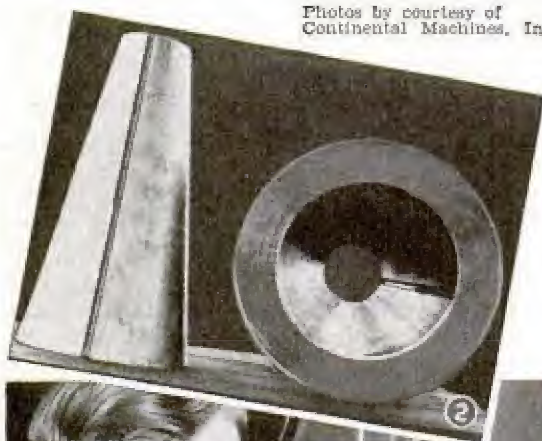
CONTOUR

By H. J. Chamberland



1—Contour-machining sector gears instead of milling made a 50 percent saving in costs. 2—Cone-shaped hole sawed in a large cylindrical piece without waste of material. Boring in a lathe would have resulted in chips. 3—The 10-in. keyway was sawed out in 20 min., which would take 4 hrs. on a shaper

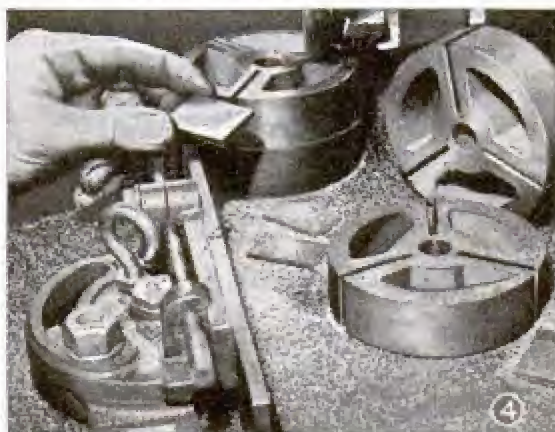
Photos by courtesy of Continental Machines, Inc.



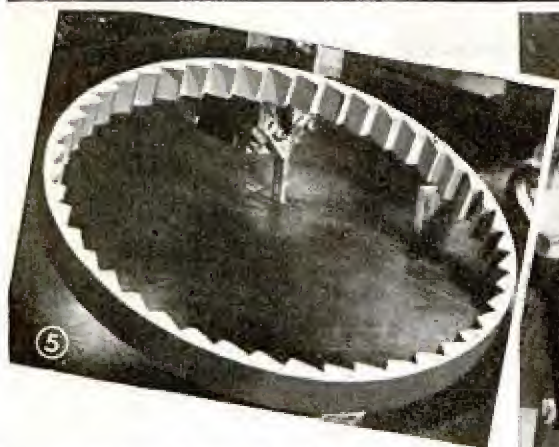
basic machines such as lathes, millers, shapers, planers, slotters, etc. As much of the work done by these other machines can be performed better and faster on a contour machine, they are relieved from unnecessary jobs and can be employed solely for work that cannot be done otherwise.

Figs. 1 to 5 inclusive show operations in which a great saving of time and material is possible. Outstanding among these examples is the material-saving operation shown in Fig. 2. Here a tapered hole, 5 in. in diameter at one end, 2 in. at the other, and 9½ in. in length, was cut with a contour machine without any appreciable waste of metal as a single cone-shaped piece was removed, which would have been reduced to chips if the hole had been bored on a lathe. Cutting a keyway 10 in. long in a shaper is a 4-hr. job, owing to the light

4—Cutting three slots in each of these disks required only 30 min. on a contour saw but would have taken 1½ hrs. on a milling machine



MACHINING



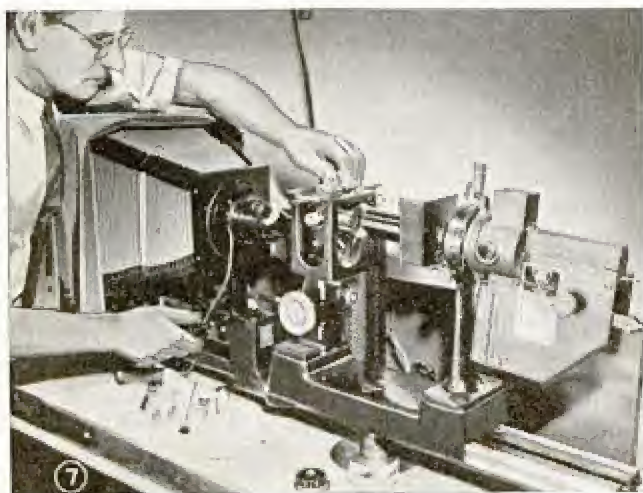
5—Another 4-hr. shaper job of cutting 45 teeth in a 20-in. internal ratchet was accomplished on a contour machine in one hour

feeds required, but on a contour machine such an operation, shown in Fig. 3, was accomplished in 20 min. To cut three slots in each of the disks shown in Fig. 4 was only a 30-min. job by contour-sawing, whereas it would have taken 1½ hrs. on a milling machine; also, the small pieces cut out were found useful for other purposes. Fig. 1 shows another operation usually done on a milling machine—cutting off part of the tooth sections of gears. By means of a simple fixture to hold and guide the pieces on a contour machine, the work was done at a saving of 50 percent in production costs. The 20-in. internal ratchet shown in Fig. 5, which has 45 teeth, was formed in 1 hr. by sawing. This work required 4 hrs. in a shaper.

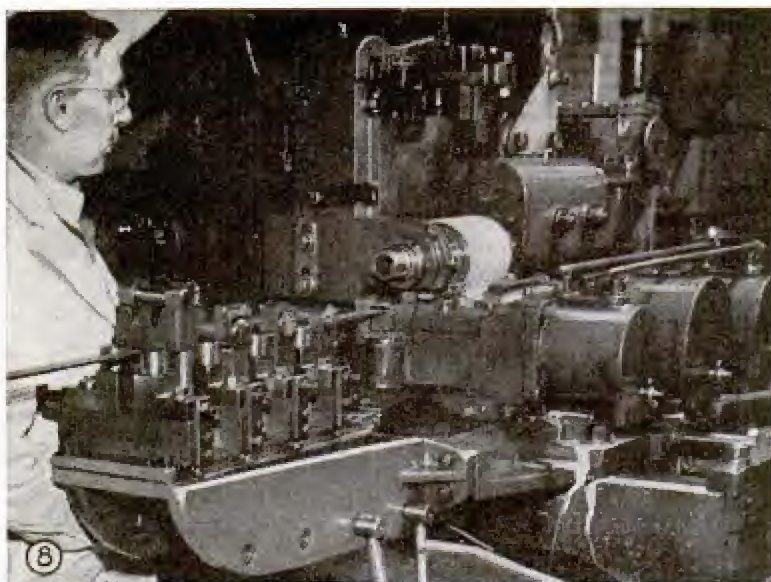
Easily and quickly mastered: As shown in Fig. 6, batteries of contour



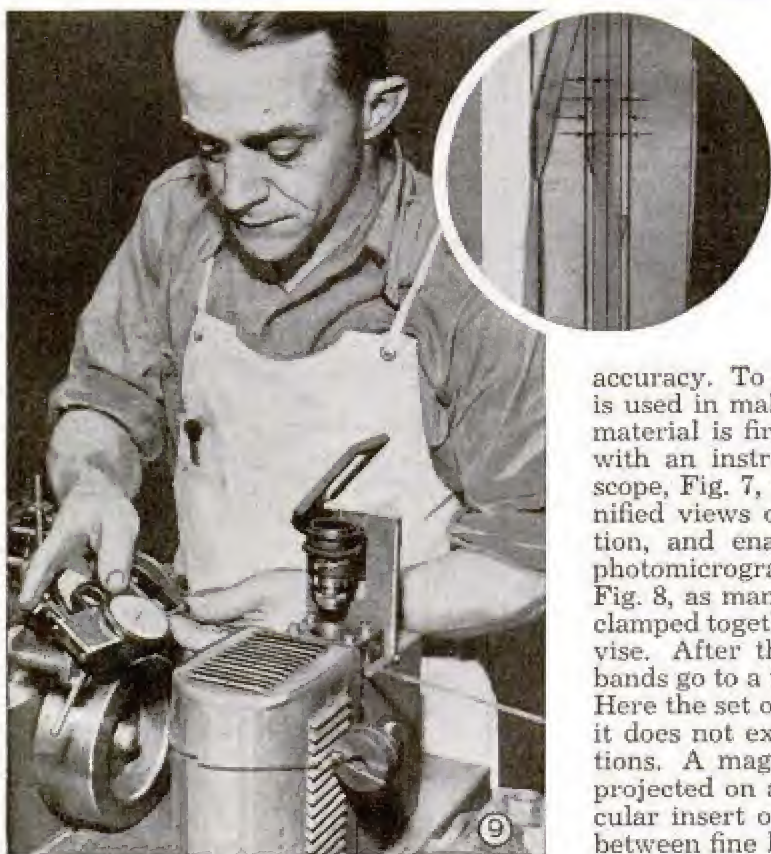
6—Batteries of contour machines are found in many large production plants, forty or fifty units not being unusual. 7—Metal for saw bands being tested for grain structure with a metalscope, which shows enlarged views and makes photomicrographs



machines are found in many large plants, forty or fifty of them in one place not being unusual. Following a brief period of free instruction provided to industry by a large manufacturer of contour machines, the average apprentice can start to produce acceptable work. A contour-machining school turns out craftsmen in this work in a practical training period of 200 hrs. After the first day of instruction, trainees already are capable of turning out



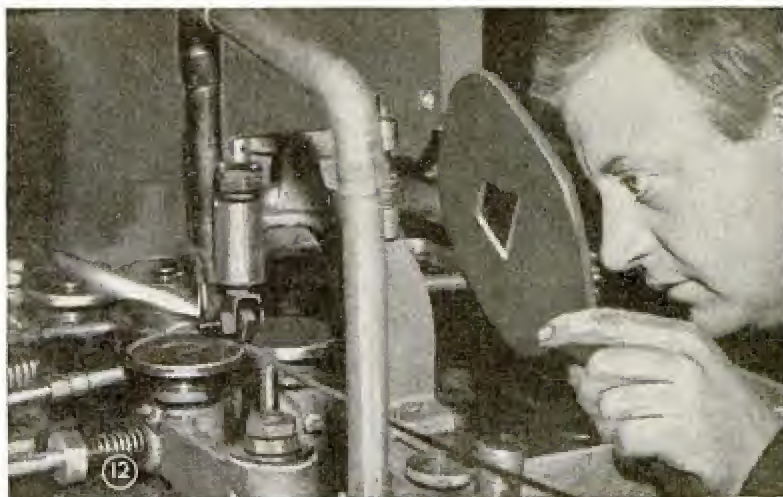
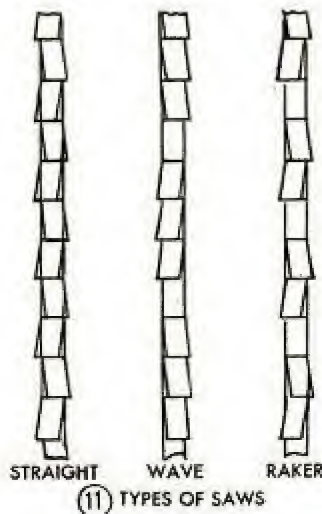
8—Teeth are milled in as many as forty saw bands at once, the bands being clamped side by side in an air-operated vise. 10—Acid test shows exact depth of flame-hardening on saw bands by discoloring hardened portions. 9—Tooth-setting machine that shows a magnified image of the teeth between limit lines so that operator can detect errors of set at a glance. The circular insert shows image as seen



accuracy. To assure that no inferior steel is used in making the saw bands, the raw material is first tested for grain structure with an instrument known as a metaloscope, Fig. 7, which provides highly magnified views of the metal under observation, and enables the operator to make photomicrographs. In milling the teeth, Fig. 8, as many as forty similar bands are clamped together rigidly in an air-operated vise. After the teeth have been cut, the bands go to a teeth-setting machine, Fig. 9. Here the set of the teeth is checked so that it does not exceed .001 in. from specifications. A magnified image of the teeth as projected on a screen is shown in the circular insert of Fig. 9. The image appears between fine lines so that the operator can detect errors at a glance. Next, the tooth portion of the bands is flame-hardened as shown in Fig. 12, so that the back of the band will remain flexible. Hardness must reach the bottom of the tooth gullets but must not exceed this. Depth of hardening is so important that all bands are given an acid test to show just how far hardening has taken place. See Fig. 10, which shows how the acid discolours the hardened teeth to a dark shade, while the back of the band, if untouched by heat, remains light.

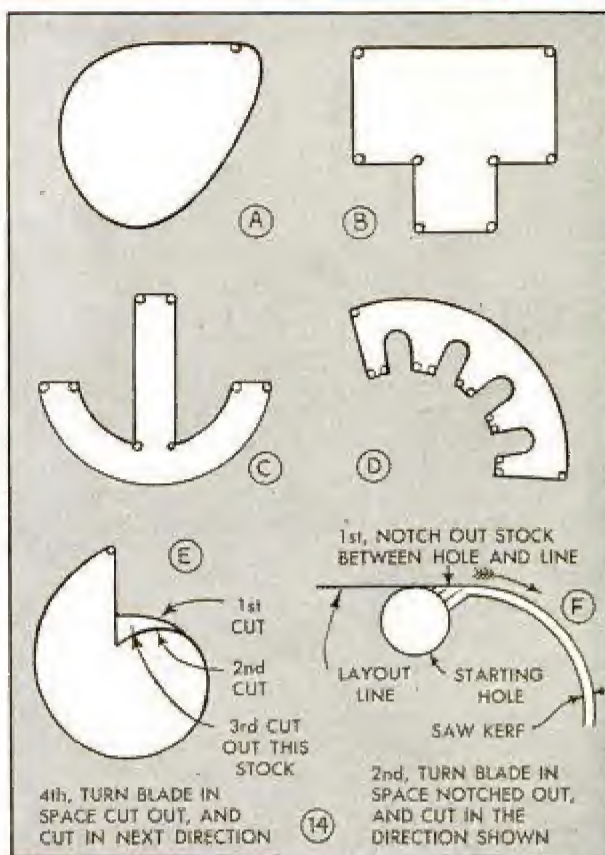
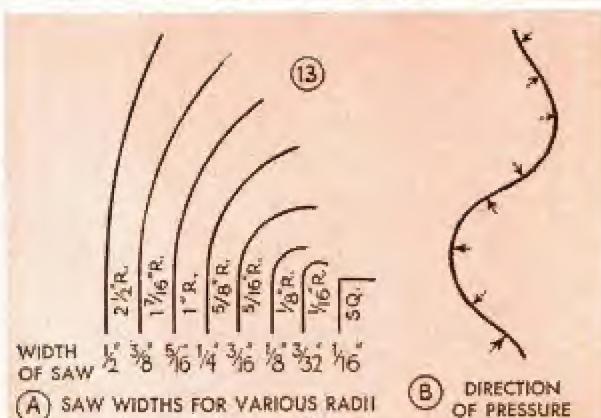
lathe faceplate straps, wrenches and other useful items.

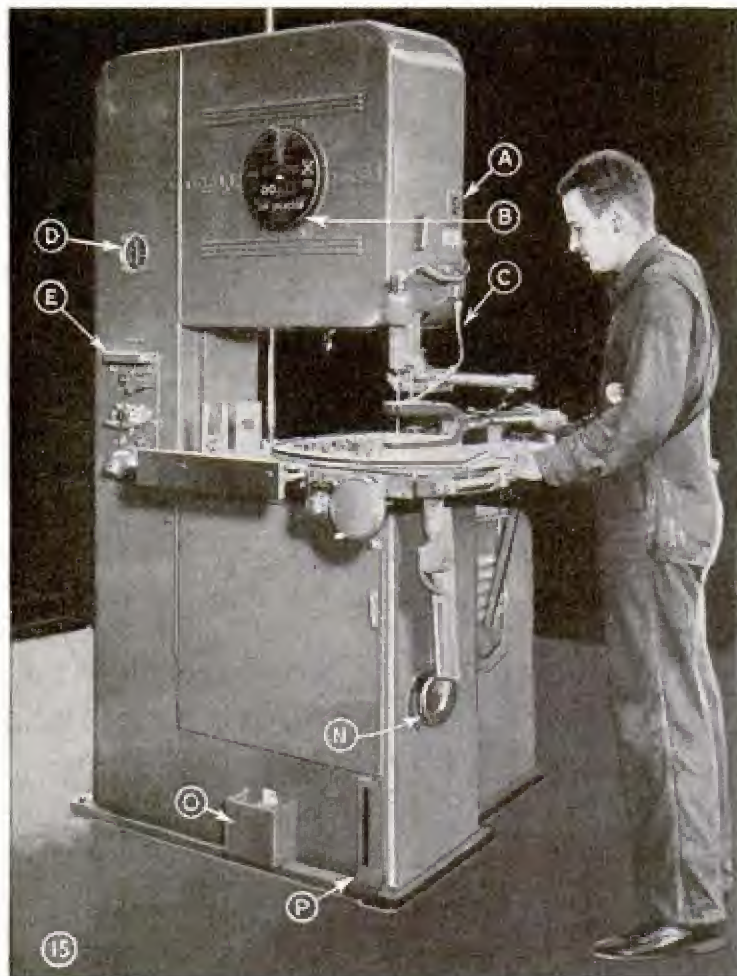
Precision in making the saws: Of the whole machine, the saw band itself, being the part that actually does the cutting, is of greatest importance. As a $\frac{1}{16}$ -in.-wide band must perform as efficiently in its range as a $\frac{1}{2}$ -in. band, the material from which saws are made must meet exacting requirements, and the teeth must be milled, set and hardened uniformly with extreme



Types of teeth: There are three types of contour-saw teeth as shown in Fig. 11, the raker tooth predominating because it will cut all solid iron and steel. The wave tooth has the smallest possible tooth spacing and is used to cut sheet and tubular stock as well as stainless steel and ductile materials. The straight tooth clears the cut or kerf of chips, and is used for cutting brass, copper bronze, plastics and non-ferrous materials.

Saw pitch: Contour saws are made in eight pitches (number of teeth per inch), varying from 6 to 32 teeth. The saws are made to cut curves and, although there are eleven widths ranging from $\frac{1}{16}$ to 1 in., the maximum width used is usually $\frac{1}{2}$ in. The widest band possible should be used always, and this depends on the radius of the curvature that must be cut. Detail A of Fig. 13 gives the approximate radius that each width of saw will cut. The widest saw possible permits more feed and decreases chattering. Using the widest set of saws is also advisable; this has .007-in. clearance on each side, giving considerable freedom to the back of the saw. As the width of a contour saw decreases, the pitch must necessarily get finer, although wide saws can have any number of teeth per inch. A standard saw for general work is a raker-type saw with a pitch of 14 heavy-set teeth per inch. Although these saws are made in three varying degrees of temper, known as A, B and C, the A-temper is given preference at present. Generally, the coarser pitches are used on soft or thick materials and operate at slow speeds. The finer pitches are used on hard or thin materials, the saws being run at higher speeds. Accordingly, 6-, 8- and 10-pitch saws are used for solid sections





- A—Starting switch
- B—Job selector (gives correct speeds)
- C—Air line blows out chips
- D—Tachometer shows saw velocity
- E—Panel light
- F—Weld selector
- G—Etching connection
- H—Line voltage regulator
- I—Welding lever
- J—Welding jaws to clamp saws
- K—Lamp and grinder switch
- L—Annealing switch
- M—Grinder to dress welds
- N—Power-feed pressure control
- O—Removable chip box
- P—Power feed release pedal

Many built-in units and controls on modern contour machines enable operators to do fast and accurate work. References above apply to Figs. 15 and 16

pitch of the saw to use, the speed and also the feed for the thickness to be cut. Having mounted the required saw band, the correct speed (50 to 2,000 feet per minute) is obtained by turning a hand wheel until a speed-indicator dial positioned at the left of the job selector, shows the speed

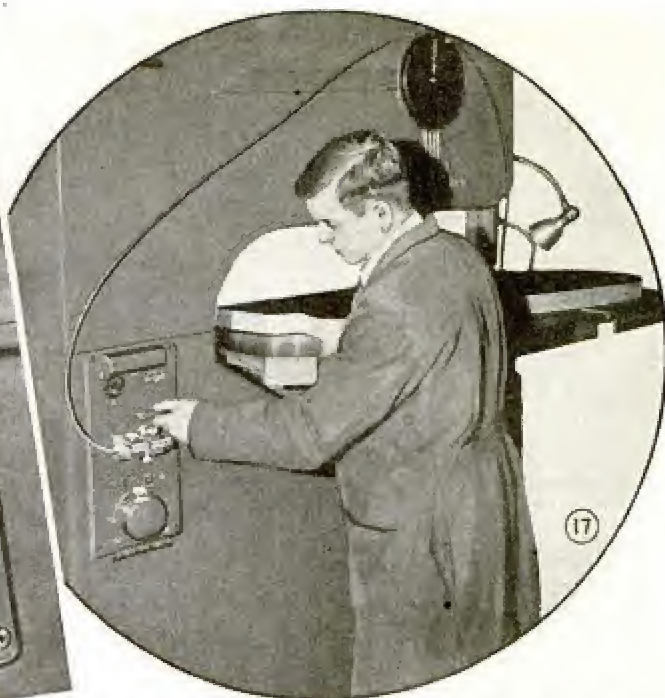
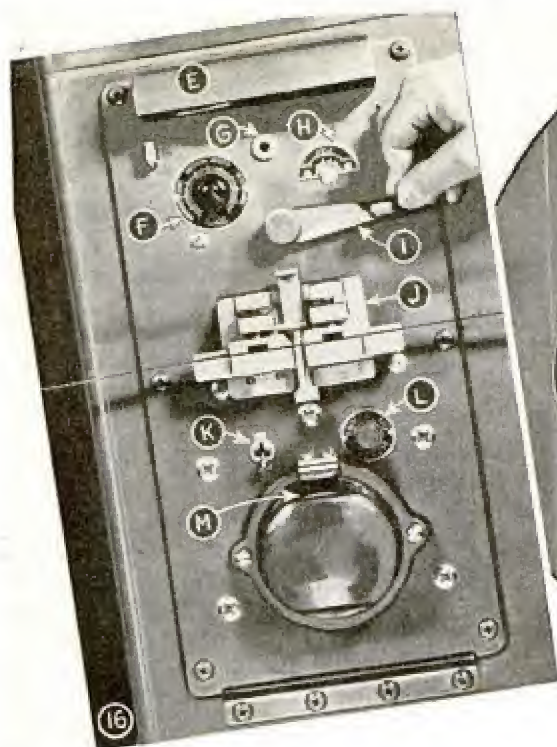
desired. The wide range of speeds, very essential in cutting many kinds of materials of varying thickness, is provided by a built-in variable speed unit.

Welding saws: After a saw has been cut for internal machining, the severed ends are joined together again by welding, which can be done in a few moments on a built-in butt welder shown in Figs. 16 and 17. The severed ends of the saw must be squared on a small grinding wheel provided on the machine, before being aligned in the jaws of the welder, both of these operations being done after the saw has been passed through the starting hole in the work. The welding heat required for a particular width of saw is regulated by means of a "weld selector." After the saw has been allowed to cool slowly, the joint is annealed by operating a switch for this purpose. Then the welded joint is surface-ground on both sides until it passes through the weld-thickness gauge. The welding unit also provides a convenient means of connecting an etching pencil for the purpose of marking parts as shown in Fig. 18.

Adjusting the saw guides: Contour-sawing machines are equipped with specially designed saw guides and inserts as

Holes to start internal cuts: To cut internal outlines one or more starting holes are required to insert the saw and to permit turning the work. Details A, B, C, and D of Fig. 14 show examples of everyday layouts for contour work. In many cases where four or more holes would be customary, the number can be reduced to one or two by notching a space with the saw to make the turns as shown in detail E of Fig. 14. Detail F of Fig. 14 shows how to follow the outline directly from the hole. When sawing curves, pressure should be applied as shown by the arrows in detail B, Fig. 13.

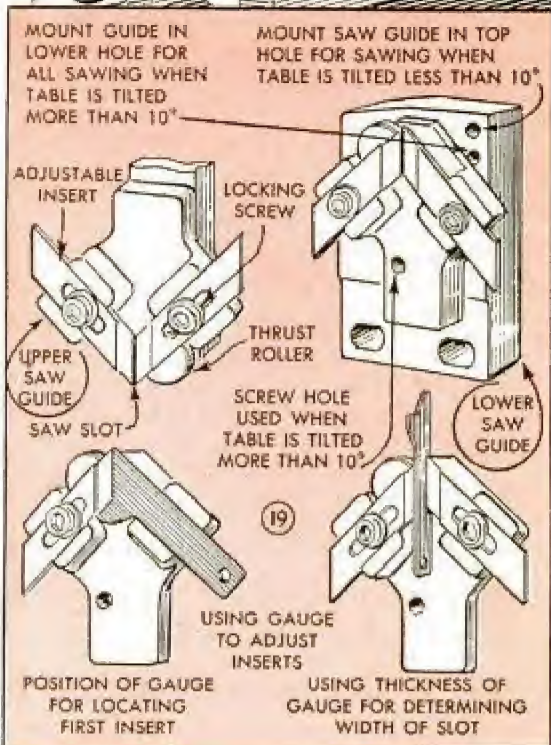
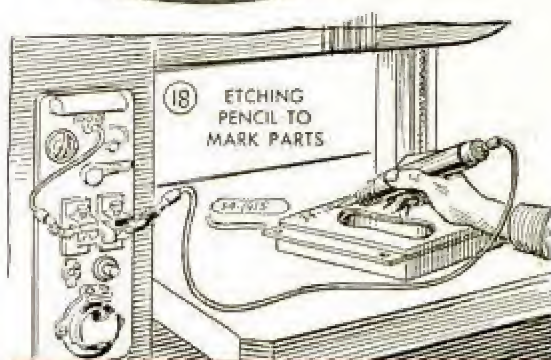
Determining speed, feed and saw pitch: Knowing the kind of material to machine, the operator simply turns a "job selector" dial, on the top cover of the contour machine (See Fig. 15) to a point designating the material. The selector gives the correct

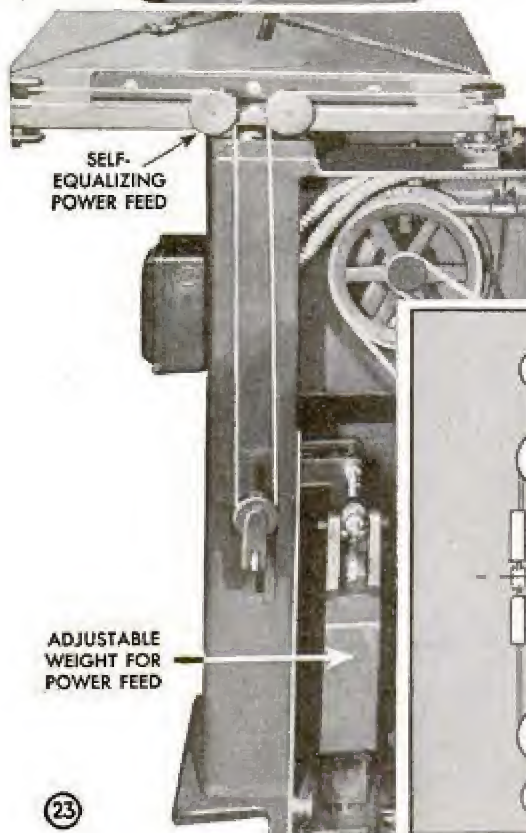
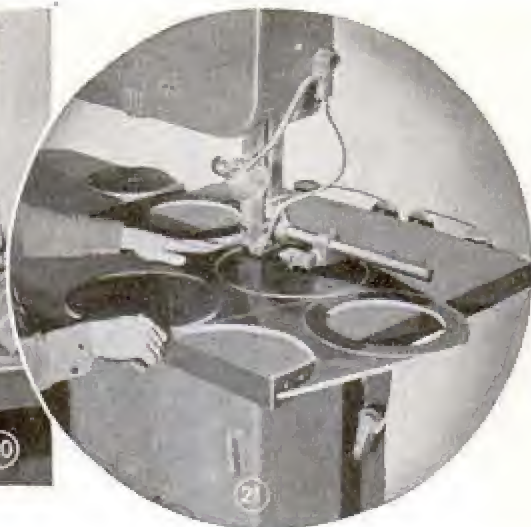
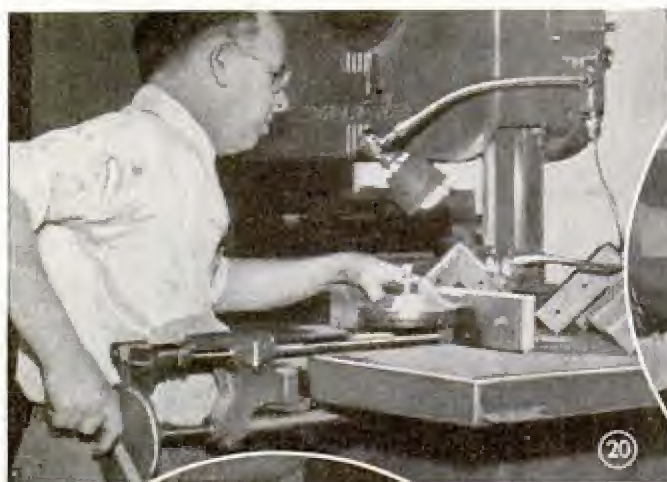


shown in the upper details of Fig. 19. There are several sets of inserts to suit all widths of bands. A gauge is provided to locate the left-hand insert and to determine the correct width of the slot, which is done before adjusting the right-hand insert. See the two lower details of Fig. 19. The saw must track perfectly before the inserts are adjusted. Proper coordination of precise tracking and adjustment of the inserts should cause the back edge of the band to contact the thrust roller lightly when the saw is not cutting.

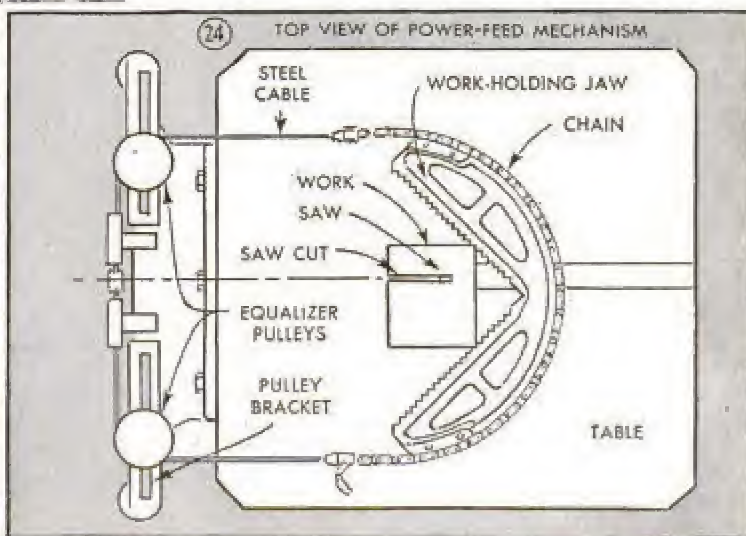
Contour-machine accessories: There are a number of accessories used to protect the operator against errors and help him to do better work. For example, the air jet as seen in Fig. 15, blows chips out of the saw kerf continually. This prevents generating heat, which would tend to weld chips to the saw teeth and eventually damage the saw. Fig. 22 shows a magnifying unit that enlarges the cutting location three times, enabling the operator to follow the layout line on the stock closely. Fig. 21 shows an attachment used to cut large circular holes up to 30 in. in diameter in stock up to 12 in. in thickness. Fig. 20 shows a cut-off and mitering attachment for making straight cuts at various angles, resulting in accuracy difficult to obtain if this were done freehand.

Importance of correct feed: Excessive feed will dull the saw teeth and produce bellied surfaces. Customarily, hand feed is used when making light cuts, but for heavy cuts the power feed, illustrated in





Figs. 23 and 24, releases both hands of the operator to guide the work. The feed depends on the width of a saw, the nature and thickness of the material. Soft or fast-cutting materials will stand a pressure of 50 lbs. with a $\frac{3}{8}$ to $\frac{1}{2}$ -in. saw. A pressure of 35 to 40 lbs. is advisable for steel being cut with a $\frac{1}{4}$ to $\frac{3}{8}$ -in. saw, but not more than 25 lbs. should be used on a $\frac{1}{8}$ to $\frac{3}{16}$ -in. saw. When sawing parts having a variable thickness, the saw part of the time is cutting a thickness that is greater than that of the material itself as is the case when the saw enters the wall of a pipe. In such cases the saw velocity for the minimum thickness of the work is too great for that of its maximum thickness. Then the saw pitch should be based on the thickness of the material but the saw velocity should be based on double the thickness. The operator can determine easily what adjustment should be made in such cases by simply referring to the job selector incorporated in the machine, as shown in Fig. 15.



Plasterer's Lightweight Mortar Box Is Watertight

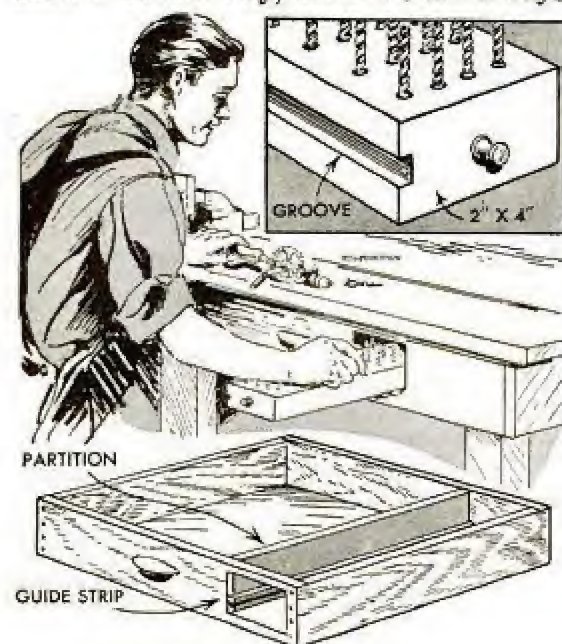
Especially handy for plasterers and others who work alone, this mortar box is ideal for mixing small batches of plaster or concrete. The box is light in weight and takes very little space in a car. Hard-pressed board, $\frac{1}{8}$ in. thick, is used for the bottom, which is curved upward at the ends. Each side consists of two boards, the inner one being cut to the desired contour of the bottom, which then is nailed in place as indicated. Following this, the outside board is nailed in place, after which the cut-out portion is inserted, pressed down tightly against the bottom and nailed to the outside board, thus making a watertight joint. A little white lead or calking compound applied to the joint before assembling will help. —Ralph K. Coffman, Arlington, Va.



Pull-Out Rack Keeps Small Drills Handy in Bench Drawer

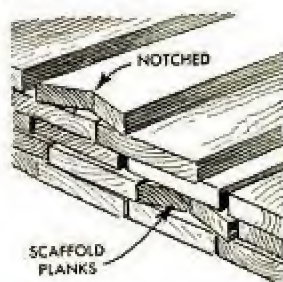
Instead of keeping small twist drills in a regular holder or loosely in a drawer, one mechanic uses a wooden block that slides into a compartment made in a drawer as shown. In this way, the drills are always

in neat arrangement for quick selection, and are well protected. Also, the block can be pulled out and set on the bench or carried about as desired. It is merely a length of 2 by 4-in. stock grooved along one side to slide over a guide strip in the drawer compartment, the front of which is cut out. A drawer pull on the front end of the block completes the job.



Notched Ends Identify Planks Used on Scaffolds

After having several selected planks, which he had saved for scaffolding, cut into pieces on a construction job, one contractor insured against a repeated mistake by cutting shallow notches in the ends of scaffolding planks. The notches identified the planks so they would not be used for other purposes by mistake.



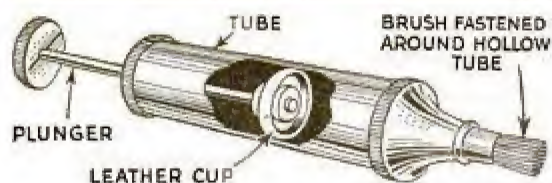
Wheeled Table Speeds Packaging In Large Warehouse



As speedy wrapping of packages in busy warehouses requires a convenient table, paper, sacks, etc., one worker simplified his job and proved himself capable of filling more orders by using the wheeled wrapping table shown above. It consists of a solid platform to which are fitted large casters and four uprights to support the top which provides a large working area at convenient height. The table also includes individual compartments for a supply of sacks and wrapping paper of sizes commonly used in packaging stock items.

Plumber Uses Plunger-Type Gun To Apply Thread Compound

Working on the principle of an ordinary grease gun, this handy dispenser for pipe-joint compound is assembled from scrap materials. It consists of a metal tube which is fitted with a plunger and an improvised

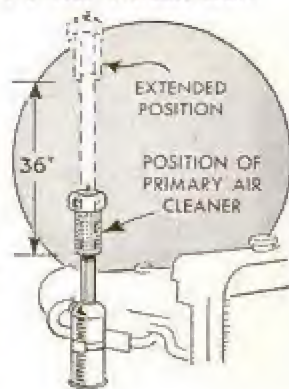


nozzle, as shown. To simplify spreading the compound, a brush is added by anchoring bristles around a hollow tube driven into the nozzle. As pressure is applied to the plunger, compound is forced through the hollow brush and spread in a smooth layer on the desired fitting.

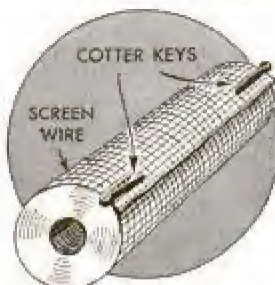
—DeLoy J. White, Hollywood, Calif.

Pipe Raises Engine Air Cleaner Above Chaff From Combine

On combine harvesters driven by an auxiliary engine mounted on the machine, trouble is often experienced with chaff and other wind-borne material clogging the primary air cleaner and choking the engine. To prevent this, one operator soldered a 3-ft. extension to the air cleaner pipe or tube, thus raising the primary cleaner above the dust and chaff into relatively clean air.



Loose End on Roll of Screen Wire Held With Cotter Keys

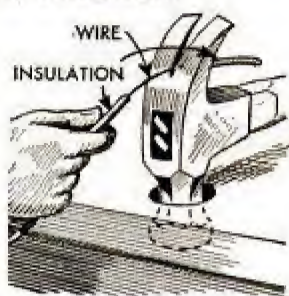


Lacking rubber bands to hold broken rolls of screen wire, one hardwareman employed large cotter keys, which were slipped over the wire at each end. Use of the cotter keys is more

convenient than the use of cord as they can be removed quickly to unroll the wire whenever desired.

Insulation Is Stripped Off Wires With Claw Hammer

When wiring fixtures, one electrician strips the insulation from the ends of small wires by pulling them through the claws of a hammer that is inserted in a hole through the bench top. In this way, the hammer is convenient for stripping wire as well as for its original purpose.





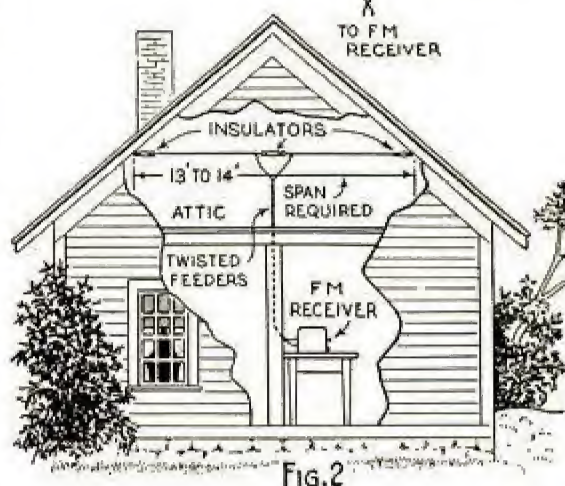
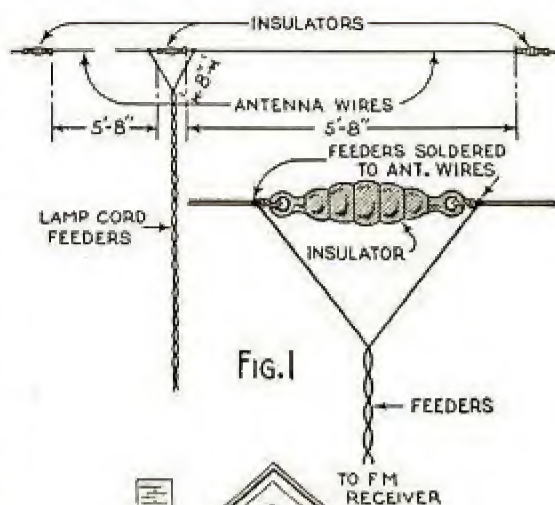
Radio

Indoor FM Antenna

MANY owners of FM receivers pay little attention to the antenna requirements necessary for maximum results. Although a high outdoor di-pole antenna will give the best performance, when properly installed for directional effect, such commercial units are now difficult to obtain. However there is no need to handicap your FM receiver with a makeshift antenna if you have three ordinary insulators, about 12 feet of antenna wire and some common twisted lamp cord long enough to reach from your attic to the set.

A di-pole antenna is merely two quarter-wave conductors lined up with the inner ends separated with an insulator and a two-conductor feed line attached to the inner ends to transfer the energy to the set without unnecessary loss. In Fig. 1, ordinary antenna wire is used for the $\frac{1}{4}$ -wave conductors instead of aluminum rods, and the twisted lampcord feeders are fanned out 8 in. at the connecting points to provide the necessary impedance match at the di-pole, instead of the usual matching transformer. The feeder line should run at right angle to the antenna for at least 8 ft. and then through suitable tubular insulators to the set, and should be kept as short as possible.

Di-pole antennas are broadly directional out from the "flat" side and have sharp minimum reception points on the ends. Therefore they should be run at right angle to the line between the station and the receiver. Determine this line with a compass and map of the local territory if possible; use rope from the insulators at the ends to the di-pole and make the attic installation accordingly. The general idea is illustrated in Fig. 2. There must be room for a span of from 13 to 14 ft. and this usually can be found in the average attic, to properly "face" the antenna to the FM station. Sometimes reflections and intervening objects change the line of reception, therefore try shifting the line of pickup slightly until the best results are reported by your assistant at the receiver.



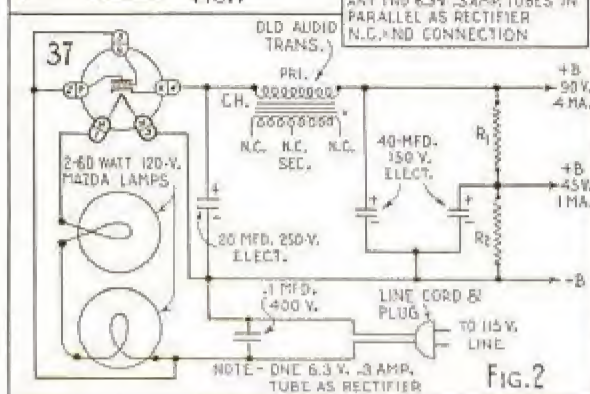
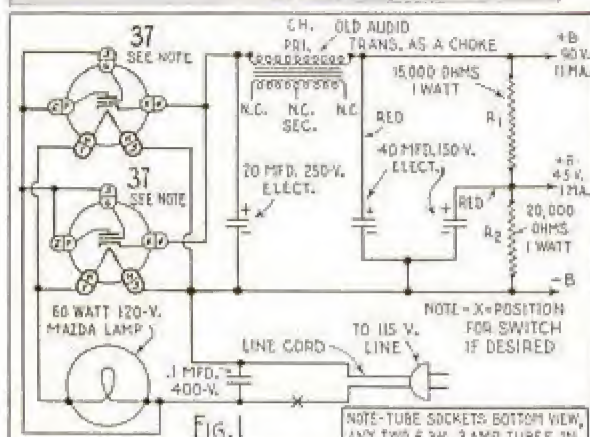
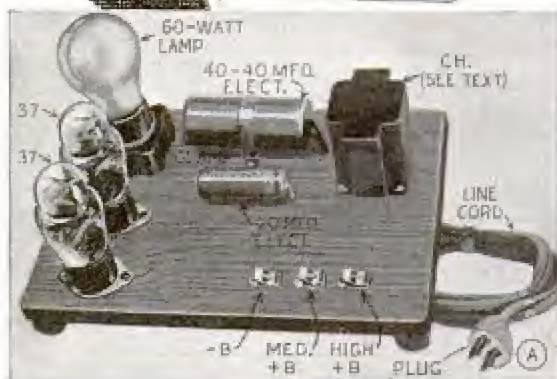
EMERGENCY "B" POWER UNIT

By Arthur I. Ratray



FILLING a real need now that B-batteries are not available for small battery-operated receivers of most types, this simplified B-power unit shown in photos A, B and C, will enable many owners of such sets to place them back in operation. It is a hum-free source of B power that will operate on any 115-volt a.c. or d.c. supply line, and is assembled from noncritical materials commonly found in the radio student's and experimenter's junk box.

An ordinary Mazda 60-watt light bulb does away with a critical wire-wound resistor or transformer that would ordinarily be used to light the filaments of the rectifier tubes; and the primary of an old audio transformer is used as a filter choke. The rectifier tubes can be type 37 or any two 6.3-volt, 3-amp. tubes connected in parallel as shown in Figs. 1 and 3. They can be type 6C6, 6D6, 76, 77 or 78 with the proper tube sockets. In any case all elements of the tubes, except the cathode and filament, are connected together. If a tube has its grid on top, an insulated grid cap and wire will have to run up to the top of the tube.

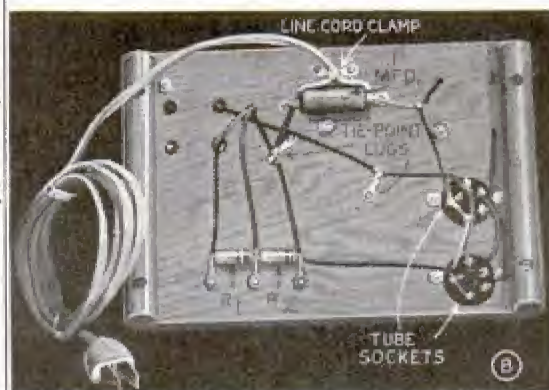


Single section 40-mfd. 150-volt electrolytic capacitors may be used instead of the dual-section unit shown in Fig. 3. The schematic circuit diagram for this unit appears in Fig. 1. Diagram, Fig. 2 shows 1 tube and 2 light bulbs in a filament and rectifier arrangement for one and two-tube student sets where 4 ma. is enough current at 90 volts.

FOR DIFFERENT CURRENT RATINGS			
45 VOLTS AT 1 1/2 MA.	R 1 IS 20 M OHMS	1 WATT	
45 VOLTS AT 1/2 MA.	R 1 IS 30 M OHMS	1 WATT	
45 VOLTS AT 1 MA.	R 1 IS 15 M OHMS	1 WATT	
45 VOLTS AT 2 MA.	R 1 IS 11 M OHMS	1 WATT	
45 VOLTS AT 3 MA.	R 1 IS 9 M OHMS	1 WATT	
90 VOLTS AT 11 MA.	R 2 IS 20 M OHMS	1 WATT	

NOTE - MA. = MILLIAMPERES; M = THOUSAND

FIG. 1A

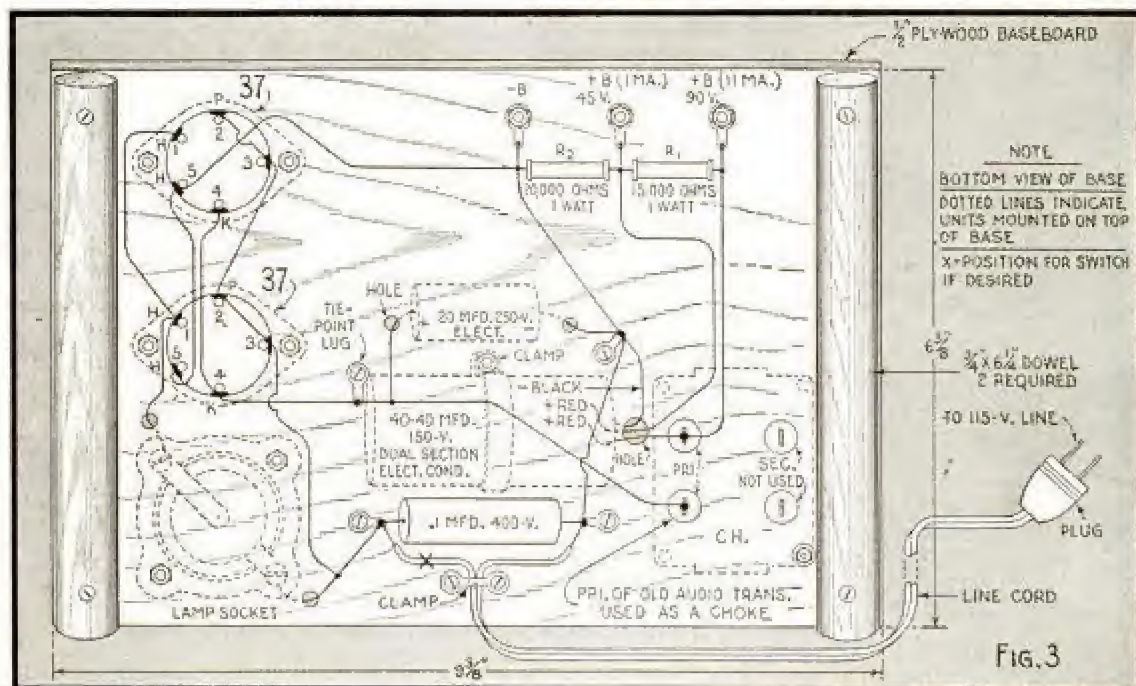
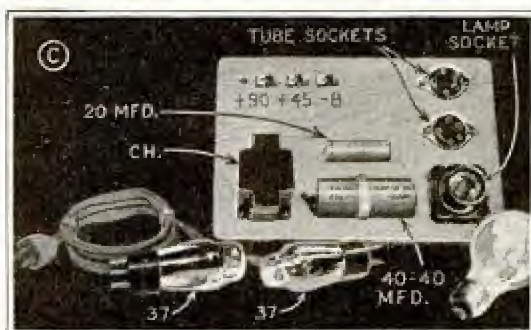


REPLACES B-BATTERIES IN SMALL SETS

If different current ratings than those shown in diagrams Figs. 1 and 3 are desired, change resistors R_1 and R_2 as specified in list Fig. 1-A. The nearest common regular value available can be used. Noncritical detailed student list R-317 is available if desired. Most owners of battery-operated sets can trace and tag the B-battery leads so that no error will be made in making the connections. One common $1\frac{1}{2}$ -volt No. 6 dry cell or two ordinary $1\frac{1}{2}$ -volt flashlight batteries connected in parallel, will supply the necessary A-battery voltage for portable battery sets with 1.4-volt tubes.

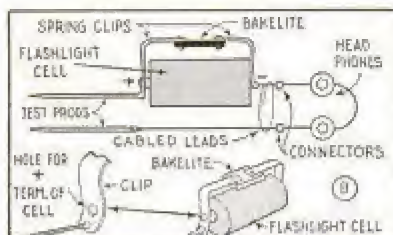
All parts are assembled on a $\frac{1}{2}$ -in. board $6\frac{1}{2}$ in. wide and $9\frac{1}{2}$ in. long. This base-board is supported on two $6\frac{1}{4}$ -in. lengths of $\frac{3}{4}$ -in. dowel rod so that the wiring is on the underside as will be noted in photos A and B.

Please remember that this B-power unit is an a.c.-d.c. piece of equipment and therefore cannot be grounded. Any receiver or other equipment used with this power unit, that should be separately grounded, must be grounded through a .1-mfd. 400-volt condenser. When using this two-tube single light bulb B-power unit, be sure that both tubes are inserted in their respective sockets and connected in parallel before plugging the unit into the wall socket.

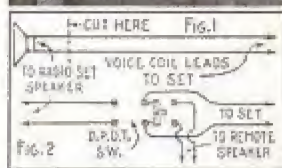
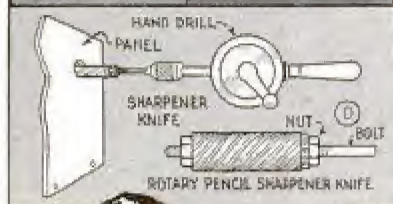
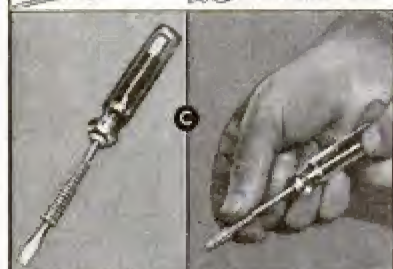


Helpful RADIO HINTS

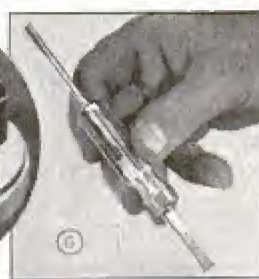
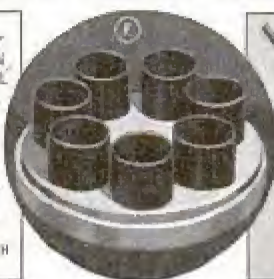
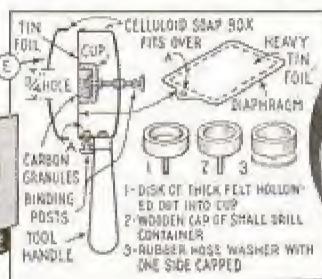
(A) Thin wall partitions in basement recreation rooms provide a good ready-made baffle for mounting an extension speaker as shown in the photo and sketch. Radio or phonograph dance music can then be fed from a radio-phonograph located in an upper room whenever desired. Extension connections are made by cutting the voice-coil leads at the set and inserting a d.p.d.t. switch as indicated in Figs. 1 and 2. Any old P.M. or other self-powered speaker may be used; no T-pad is necessary at the remote speaker as the volume can be controlled at the set



(B) Handy flashlight-battery clip for headphone testing to locate open circuits in voice coils, audio transformers, etc. Under test a distinct click will be heard in the phones if the circuit is complete. (C) Small packet screwdriver has protective end shield. (D) One knife section from an old rotary pencil sharpener makes a useful reamer for enlarging panel holes to mount replacement parts requiring larger mounting holes. (E) This single-button carbon microphone, made from simple materials, may sometime solve an important emergency problem; it also supplies the student with a working unit for classroom experiments. One binding post makes direct contact with the foil, the other with the carbon granules in the cup. Three suggestions are given for making the cup from scrap materials

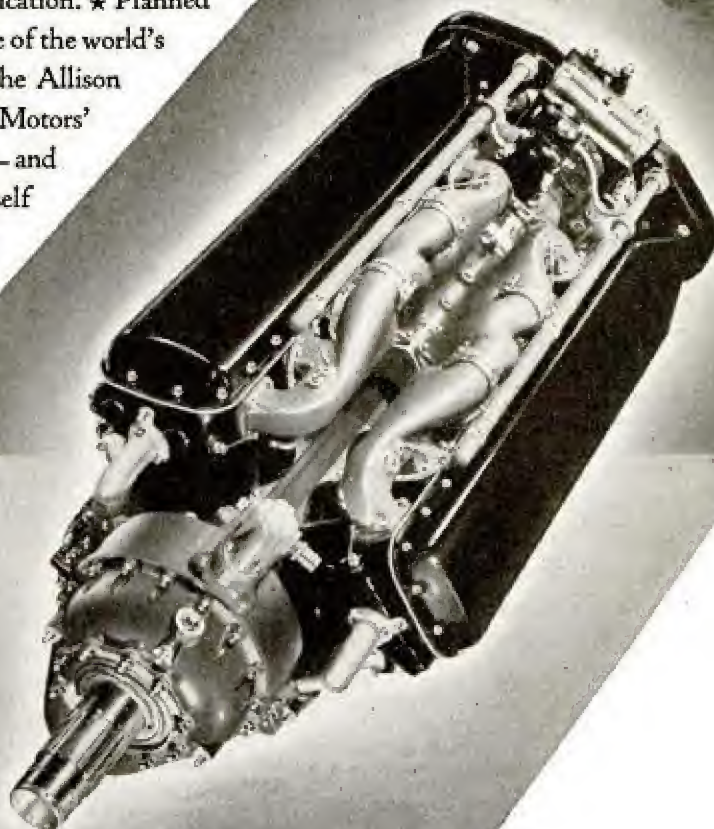


(F) Convenient holders for nuts, machine screws and other small parts, made by inserting old tube bases in holes drilled in a circular wooden baseboard to take the prongs. (G) Dual screwdriver for radio workers, saves time and toolbox space. Both sections are insulated in the plastic handle



MASTER OF MANY CLIMES

You will find the Allison engine busy today in tropic heat and numbing cold. ★ You will find it strafing the enemy through the ground haze of the desert — you will meet it, too, in the sub-arctic temperatures of the upper air. ★ But wherever you find it, you find sturdy dependability doing a masterful job, carrying the fighting pilots of the United Nations successfully on their missions—then winging them safely home again. ★ The Allison is manufactured under General Motors standards of engineering, metallurgy and fabrication. ★ Planned from the outset to be one of the world's finest aircraft engines, the Allison is living up to General Motors' purpose in creating it — and in the process proving itself master of every climatic condition under which men fight.



POWERED BY ALLISON

P-38 — Lightning
P-39 — Airacobra
P-40 — Warhawk
P-51 — Mustang

LIQUID-COOLED AIRCRAFT ENGINES

Allison

DIVISION OF





Dear Bill:

I'm the guy up front

This is the outfit for an old cycle fan! I thought I knew motorcycles, but the Army's teaching me plenty!

I'm riding an Indian -- as usual. What a machine! Our operations course is plenty tough but Indian's got the guts to take it -- and for easy handling and safety, give me Indian any day!

Incidentally, Indian's got some swell new improvements. It'll be a really great machine to ride when this war's over. Regards to the gang!

INDIAN MOTORCYCLE COMPANY, SPRINGFIELD, MASS.



BUY WAR BONDS NOW

★ ★ TO BUY AN INDIAN LATER ★ ★

"You Can Do It Better With Gas"

(Continued from page 69)

perior to natural rubber in gasoline, oil and chemical resistance. It is more stable to light and air and has greater wearing properties. Some trucks using synthetic rubber tires have gone over 35,000 miles, climbing hills with little side-slipping. On curves at high speeds, the synthetic tire is safer than the natural. One can feel confident that synthetic rubber tires will evolve with a life of at least 100,000 miles. The tires may well outlive the motor car.

Natural gas is an important source of high explosives. It is cracked into hydrogen, which is combined with nitrogen from the air to produce synthetic ammonia; this is readily oxidized with air into nitric acid. Combining ammonia and nitric acid produces ammonium nitrate which is a high explosive used in the war.

World War I called for 150,000,000 pounds of TNT; the present war calls for 3,000,000,000 pounds a year. Benzene from natural gas is readily converted into phenol; combine that with nitric acid and the result is picric acid, a high explosive. Sulfuric and nitric acid, both obtainable from natural gas, are raw materials necessary for high explosives needed in this war, some of them on a scale twenty times that of World War I.

Another war necessity is trinitroglycerine, the commonest form of which is dynamite. Its principal source has been the soap industry, but glycerine can now be produced from propane or propylene gas.

The most destructive explosive known to man is tetranitromethane — produced by nitrating methane gas. It is extremely difficult to handle. About 20 years ago in a Swiss laboratory ten grams of tetranitromethane exploded, killing ten men, injuring 20 and nearly wrecking the building. No commercial process has yet been worked out to make this product usable by our armed forces. There is a job open to some brilliant organic chemist.

Anaesthetics are vital in a world at war, and these too are derived from natural gases. One of the primary needs of the medical profession has been anaesthetics free from post-operative dangers of nausea and pneumonia. Ethylene acts quickly, inducing deep surgical anaesthesia. Since 1930 cyclopropane has been widely adopted as one of the safest anaesthetics.

Even the farmer and orchardist can "do it better with gas." Ethylene is used to accelerate the ripening of citrus fruits.

(Continued to page 148)



Life Guards - FOR BOMBER CREWS - FOR YOUR ENGINE



OXYGEN PRES-
SURE GAUGE—
built by AC



AUTOMOTIVE
SPARK PLUG



IN THE THIN SUB-STRATOSPHERE, fighter pilots and bomber crews need extra oxygen to live. And they *must* know when the supply is running low. So, AC builds pressure gauges for each oxygen supply cylinder.

Those gauges must not only be accurate—they must be absolutely dry, and must *stay* dry, or an oxidizing "explosion" will burst every lung, instantly.

To build such vital devices requires fool-proof, precision manufacturing. Thus, AC's long experience in producing millions of peacetime Spark Plugs, Oil Filters, Fuel Pumps, Speedometers, and instruments comes into full play for war.

For Your Engine

But, no matter how well a device is made, it must be *kept* in good condition. This is also true of your spark plugs. Dirty spark plugs

waste gas, cause hard starting, and rob your engine of power. They should be cleaned and adjusted—*regularly*.

Through its Conservation Service, *any* repair shop—*anywhere*—can do this for you. Such shops can also give quick, expert service on the eight other AC products in use on many millions of vehicles. If you wish to know what care *you* should have, read the brief story below. Then, to conserve the life of your vehicle,—and gasoline, oil, and tires as well,—follow the suggestions given there. When replacement becomes necessary, select AC—and be sure of complete satisfaction.



Awarded to the men and women of AC on September 2, 1942, for outstanding achievement in producing for Victory.

AC SPARK PLUG DIVISION
GENERAL MOTORS CORPORATION



SPARK PLUGS—Dirty or worn plugs waste as much gas as one coupon in ten. Oxide coating collects on the plugs and causes them to misfire,—especially when the engine is working hard. Dirty plugs also cause hard starting which weakens your battery. Under present slow driving conditions, have your plugs cleaned and adjusted every few months.



AIR CLEANERS—A dirty air cleaner increases gasoline consumption because it chokes down the flow of air into the carburetor. Your air cleaner should be rinsed whenever your car is lubricated.



FUEL PUMPS—Practically trouble-free. But, if yours has been in use thirty or forty thousand miles, it

may be worn to the point where a check-up is due.



DRIVING INSTRUMENTS—Speedometer, gasoline gauge, oil pressure gauge, ammeter, and temperature gauge seldom need service. But, if they give trouble, have them cared for *at once*.



OIL FILTERS—Slow driving accelerates formation of soot and carbon in engine oil. If not constantly filtered from the oil, this dirt will clog piston rings, cause increased consumption of oil and gas. So, replace your oil filter element whenever your dealer's AC Oil Test Pad shows that your oil is dirty.

BRING VICTORY QUICKER—BUY U. S. WAR SAVINGS STAMPS AND BONDS



**IT, too, can "GET TOUGH"
with armor plate**



IT TAKES a high-velocity gun to pierce the thick steel hide of a heavy fighting tank. Likewise, it takes an extra-sturdy file to remove drill burrs and rough edges in fitting together the armor plates of one of these land battleships.

When consulted, Nicholson promptly designed *The right file for the job* . . . a special file which resists not only the abrasive action of this "super" alloy steel but the chipping and breaking out of the file teeth as well.

The Nicholson File for Armor Plate is one of many special files developed for war and other special purposes. And one of more than 3000 kinds, cuts and sizes made by Nicholson.

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Ethylene and propylene stimulate potato growth and shorten the growing season for tomatoes, grapefruit and oranges. German botanists report up to 100 percent increase in the yield of potatoes from seeds treated with ethylene gas, besides a richer vitamin C content. The Russians found butylene gas hastens maturity of the walnut, peach, apple, cherry, plum, apricot and pear. The trees are enclosed in tents for about two weeks before the start of the growth cycle and butylene gas is fed into the tent. Fruit picked green is also ripened by treating with liquid hydrocarbons, byproducts of gasoline cracking.

The new world of plastics, too, owes much to natural gas. Bakelite, for example, is based on formaldehyde, which can be obtained from natural gas. The phenolic plastics and cresols are also potentially available in natural gasoline. Plastics find use as paints, varnishes, addition products for lubricating oils, and molded materials. Airplane manufacture is calling for more and more plastics. Methyl methacrylate resins are used as the transparent non-shatterable parts where great visibility is necessary, and this will undoubtedly be used by the automobile industry after the war. A high degree of visibility from all over the motor car will be worked into the new design requiring less supporting frame work, and a clear vision rooftop with sliding window will undoubtedly take the place of present designs. In fact, the motor car of the future may well be substantially all plastics. Any of the components necessary for the manufacture of plastics of all types can be made from natural gas.

In a pinch, natural gas may even become a source of food. In the United States glycerine (available from natural gas) and soap are produced from the splitting of fats; the Germans are reversing the process to produce edible fats for food. It is not the type of fat to which we are accustomed, but it is helpful under the critical food conditions existing in Europe.

An enormous amount of research is going forward in a study of natural gas and gasoline to enhance their importance in the war—through solvents, plastics, high explosives, acetylene, synthetic rubber, lubricating oils and aviation gasoline. As a matter of fact, if one starts with methane gas alone, all of the known synthetic products man has produced in organic chemistry can be derived, and there are over 500,000 of them. Any synthetic product desired can be produced at a price; the hydrocarbons are all potentially available to be converted into the manifold products that man requires in a modern world.



Helping Build the Army's Bridges

"Bridges quickly built where wanted" . . . might well be a slogan of the Army's resourceful Corps of Engineers. When a river blocks the movement of thousands of troops, minutes are priceless . . . and the Engineers waste none of them!

Swiftly the Engineers' bridge equipment speeds to the chosen crossing. Big, buoyant pontoons are launched, maneuvered, and secured in position. Bridge decking is extended over them . . . and like magic a floating roadway stretches to the farther shore, ready for the tramp of troops, the rumble of tanks and trains of supply trucks.

Helping build the Army's bridges is one of many war-time jobs where Evinrudes serve with unflagging power and rugged stamina. Delivering to our fighting forces the finest outboard motors that skill and long experience can build . . . that is Evinrude's responsibility today. And you can be sure that, after Victory, the Evinrude you can't buy *now* will be a motor *worth waiting for!*

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OUTBOARD MOTORS

★ EVERY DOLLAR HELPS SPEED VICTORY . . . BUY MORE BONDS!



Translated from the German

A CAPTURED German dispatch, during the last war, is revealing. We quote: "The high percentage of captured Marines wore 'Marksman,' 'Sharpshooter,' or 'Expert Rifleman' badges. Their marksmanship is remarkable. . . and their rifle fire broke up every counter-attack we launched!"

If you expect to join our armed forces, start learning as much as you can about rifle shooting NOW! For knowing how to handle a rifle can help you *get ahead faster*, and—it may save your life.

Less than 2% of inducted men know anything about rifled arms! That is why O. F. Mossberg & Sons, Inc., urges every owner of a .22 rifle to help teach a neighbor how to use a gun.

Share your rifle with your neighbor

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This program is intended to train the maximum number of our citizens in the use of small arms. It is invaluable to civilian defense units, guards, etc., and to *all* prospective service men. For in *this* war, even quartermasters, signal corps and cooks are armed—and must learn how to shoot. Mail the coupon for helpful, free booklets.



Today, 100% in war work. In normal times, manufacturers of 22 cal. RIFLES, SHOTGUNS, TELESCOPE SIGHTS, TARGO GUNS AND EQUIPMENT.

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Please send "The Guidebook to Rifle Marksmanship", also new Questions-and-Answers folder which tells How and What to Do NOW.

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Mining Black Gold for Victory

(Continued from page 37)

develop a method of "mining" the sands successfully. The oil is found at depths of from 8 to perhaps 200 feet below the surface, hence open pit extraction is possible.

On the basis of 250 tons of oil sands processed, more than 175 barrels of oil are recoverable. The plant itself finds that 300 barrels of oil have been secured from the processing of 400 tons of oil sands. On this basis, production of 10,000 to 20,000 barrels of oil per day is quite feasible. Carrying these estimates further, officials envision the production of 100,000 barrels of oil to the acre.

Although the entire area is estimated at from 10,000 to 20,000 square miles, the area immediately available is materially less. The potential of 100 billion to 250 billion barrels of oil is therefore reduced to a billion barrels obtainable within the present mineable area.

One billion barrels equals the production of a 10,000-barrel oil well for 274 years. In volume, it equals a lake four miles wide, 10 miles long and five feet deep. It can be compared to the capacity of 87,500 trains of 50 tank cars each; placed in a single file, these trains would span the earth with plenty to spare. A billion barrels of oil contain enough asphalt to surface 600 roads 20 feet wide around the earth, leaving enough material to produce 21,000 gallons of gasoline for every car in Canada.

Postwar development of the region may solve, once and for all, the problem of synthetic rubber supply. Athabaska oil sands are considered a likely source of butadiene, an important basis for the manufacture of synthetic rubber. Once the production of butadiene is launched and methods are found to re-establish a national economy that is independent of the world supplies of raw rubber, the full economic importance of Alberta's oil sands will be established.

Meanwhile, these workers in the Canadian wilds are plugging away around the clock to capitalize a stroke of luck for the United States and the friendly nation to the north.

Scale Can Weigh Speck of Pepper

A scale used at Westinghouse Research laboratories is so delicate that it can gauge the weight of a single layer of oxygen atoms on a sliver of steel the size of a safety-razor blade. Such a layer of atoms weighs two hundred-millionths of an ounce—about as much as a speck of pepper.



THE REASON FOR A NUT

• There's only one reason for a nut.

That is to hold things together.

To make a nut that does this isn't as simple as it sounds.

But here is a nut that goes on and locks — all by itself — wherever you want it.

It holds tight in spite of vibration, stress or strain.

It can be taken off when necessary — then goes right back on and locks again.

It's the Elastic Stop Nut.

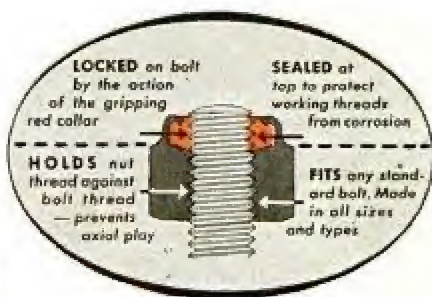
The secret is the elastic red collar in the top. This hugs the bolt — keeps nut and bolt threads tight together and stops all

shimmy and axial play.

That makes the nut stay put.

The Elastic Stop Nut is not a new invention. We've made them for years.

And of the billions in use, we've never heard of one that has failed to do its job better than any other similar fastening.

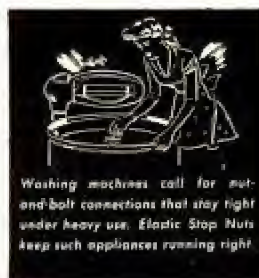


ELASTIC STOP NUTS

Lock fast to make things last



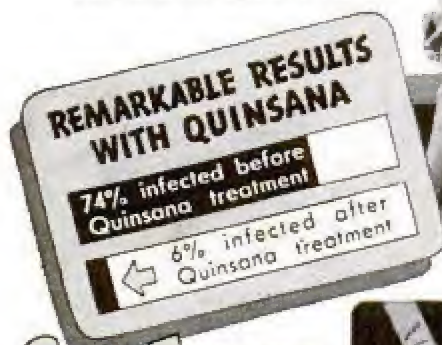
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CUTTING OPEN SHOES OF INFECTED PERSONS, AND EXAMINING IN LABORATORY, REVEALS THAT ATHLETE'S FOOT FUNGI MAY THRIVE IN SHOES AND RE-INFECT FEET. TO FIGHT RE-INFECTION, USE **QUINSANA POWDER** IN SHOES AND ON FEET. AMAZINGLY EFFECTIVE!

BEWARE OF SYMPTOMS
OF ATHLETE'S FOOT :- PEELING AND CRACKS BETWEEN TOES, ITCHING, SOGGY SKIN. EVEN MILD CASES MAY SUDDENLY BECOME SERIOUS!



2-WAY TREATMENT
CLEARED UP PRACTICALLY ALL OF THOUSANDS OF TEST CASES OF ATHLETE'S FOOT. USE **QUINSANA** DAILY FOR PREVENTION AND RELIEF. ALSO EXCELLENT FOR EXCESSIVE PERSPIRATION, FOOT ODOR.



Use Quinsana on feet daily to help prevent and relieve infection



Shake Quinsana into shoes to absorb moisture, reducing chances of re-infection



50c

FOR ATHLETE'S FOOT

Heroes of the Coast Guard

(Continued from page 63)

had leaped over the side of the Little, he staggered ashore. He slept on the beach and made his way to a Marine hospital.

In Africa, as at Guadalcanal, the Coast Guardsmen helped bring troops and supplies ashore. One of the officers who helped direct that operation was Lieutenant Bernard Scalan of Edwardsville, Ill.

He said: "It was the darkest night I'd ever seen. We knew of the existence of some shore batteries and a fortress, atop of which was a huge searchlight. We had instructions to withhold all fire unless the light was turned on.

"Well, the light did come on and immediately the Navy and Coast Guard support boats started hammering away at it—putting it out almost immediately. Then the enemy shore batteries opened up on us and the lead and shrapnel came down like rain."

Coast Guard aviation, famous in peacetime for mercy flights and seemingly impossible rescues, is upholding that reputation in war. Its greatest aviation hero to date is Lieutenant John A. Pritchard, of Burbank, Calif. He is listed as "missing" now. Some of his rescues were little short of miraculous. Pritchard, operating a Grumman amphibian from a Coast Guard cutter on Greenland patrol, had been flying reconnaissance flights over the treacherous North Atlantic. One day a radio message crackled through to the cutter.

"Army Flying Fortress down on Greenland ice cap, latitude X, longitude Y. Proceed to nearest shore and determine if rescue can be made."

The Coast Guard cutter steamed under full speed toward the area indicated. Lieutenant Pritchard assured the skipper of the cutter that he could make a landing on the ice, pick up the survivors, and take off.

"I'll land with the wheels retracted as if coming down on water," he said.

The commanding officer agreed to the plan and Pritchard and a radioman took off. For a half hour they soared over the desolate ice cap. When they sighted the wrecked Army plane, the radioman sent a message that they were coming down.

"Don't try it—you'll never make it!" came the reply from the Army aviators.

But Lieutenant Pritchard put his plane in a long glide where the ice was covered with snow. He landed as smoothly as if he were coming into a sheltered lagoon.

He loaded two of the injured Army airmen aboard his amphibian and took off for the cutter. It was after dark when he re-

(Continued to page 154)

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...the rolls count!*



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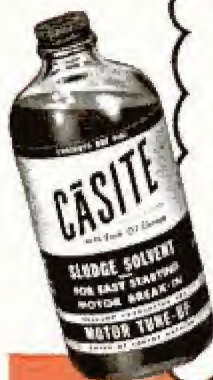
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turned and made a landing, guided by the cutter's powerful searchlight. As he brought his plane alongside, the crew, manning the rail, cheered the heroic Coast Guard pilot to the Arctic skies.

On coastal patrol, convoy and antisubmarine duty in the North Atlantic are the Coast Guard's "iron men and iron ships," the Corsair fleet—pleasure yachts painted slate gray and fitted with guns and depth charges. Unlike men in other branches of the Coast Guard and the Navy, the men of the Corsair fleet are studying old-fashioned seamanship—learning to "hand, reef and steer," as in days of long ago.

It's a hard life in rough, wintry weather. Howling gales, ice-covered sails and cold-stiffened ropes make the job anything but play. In cold weather, Coast Guardsmen of the Corsair patrol wear heavy, fleecelined coats and gloves. Goggles and heavy canvas masks protect eyes and face from biting, sub-zero temperatures.

Last winter one of the Corsair crews reached safety at a southern port after weeks of buffeting in heavy storms which left them half sinking, their rigging an almost hopeless tangle of torn canvas, broken wires and frayed ropes. Their radio was washed out by salt water which half-filled the cabins, so the Corsairs bailed with buckets, patched up their rigging and sailed most of the 400 miles back to the coast. They were taken in tow once by a British warship; but the towline parted in the night. Days later a Coast Guard cutter sighted them, put a fresh crew aboard and rushed the half-starved Corsair men to a shore hospital.

Early in March, the Coast Guard cutter Campbell, skippered by Commander James A. Hirshfield of San Antonio, Tex., depth-bombed five German submarines and shelled, rammed and sank a sixth in a fierce, 12-hour running fight with a U-boat pack in the North Atlantic. The 2,000-ton Campbell was protecting a convoy and her furious attack on six of Hitler's submarines saved it from much damage.

The sixth U-boat was first attacked by shell fire, then rammed. As it drifted free after the collision, it again came under the Coast Guard cutter's blazing guns at point blank range. Commander Hirshfield, who had been slightly injured by shrapnel, watched the big U-boat shudder from the impact of the exploding shells and slowly settle beneath the waves, stern first.

Wherever the enemy meets the tough, well-trained men of the Coast Guard—on land or sea, or in the air—he'll find them living up to their motto *Semper Paratus*, "always ready."



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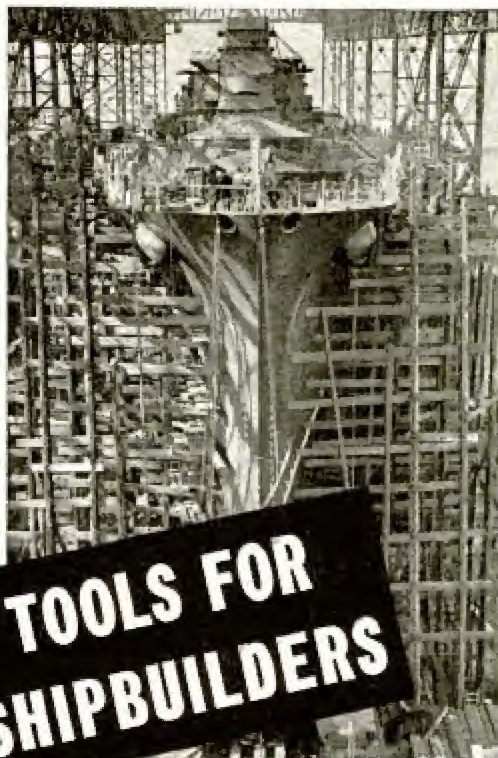
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Throughout the shipyards, the plane factories, the arsenals and all wartime industry, workmen are busy with Disston files, hack saw blades, tool bits, and many other wood and metal cutting tools.

And in the hands of the craftsmen who are building the cantonments, the depots, the emergency housing of all kinds are Disston saws . . . preferred for their fine steel, excellent balance and fast-cutting blades.

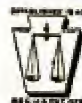
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Disston D-23 Lightweight Straight-back pattern. Always popular with saw users demanding quality and workmanship. Made in 24-inch 8 and 10 points cross-cut; 26-inch 7, 8, 10 and 11 points cross-cut, 5½ points rip.

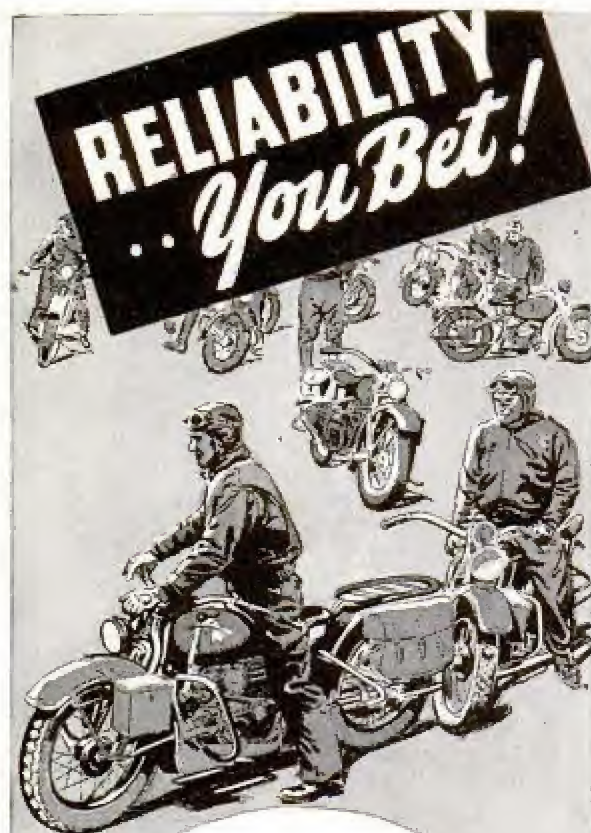
• If you need tools for *essential* war work see your hardware dealer and ask for Disston—a name world-famous for tool quality and performance.

TOOLS LAST LONGER with the help of the Disston Saw, Tool and File Manual—FREE from your hardware dealer, or write for your copy directly to us.



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HARLEY-DAVIDSON
MOTORCYCLES

Plants Grown to Order

(Continued from page 58)

bushes will be able to produce latex within a year of the time they were planted.

Until now, most of the improvements that have been made to plants have resulted from long years of patient selection, breeding and careful watching for "sports." Today a single application of a chemical compound may create an improved strain. All such improvements are really an unbalancing of a normal plant. That is, beets in which the sugar content has been raised, tomatoes bred for large firm fruit, or melons selected for small number of seeds, would all die out or revert back to less desirable types if allowed to grow wild.

Simultaneously with this research in new kinds of plants, science is increasing its ability to take plants apart and to extract more and more useful products from them. Oils and plastics from soy beans, building materials from sugar cane, and many oils and allied products from corn and peanuts are only a few items on the list.

Oranges, for instance, used to be regarded mainly as a luxury. Now they are a vital crop for many reasons. First, the high amounts of Vitamin C that they contain make them important in a properly balanced diet, and citrus concentrates that retain high amounts of natural Vitamin C are a dietary supplement for American soldiers. Shipments may be in the form of a concentrated juice that takes up one-sixth the space that whole juice requires, or as a dehydrated powder that is added to Army "K" rations. Mixed with water, the powder is restored to its original bulk, producing natural orange juice.

Citric acid is one byproduct of the citrus industry, pectin is another. This is the material that produces the set in jelly, but the byproducts department of the California Fruit Growers Exchange is finding unexpected and widespread uses for special kinds of pectins that are obtained from citrus fruits. Japanese agar, cut off from us by the war, has a satisfactory substitute in sodium pectate. A pectate pulp is used to modify oil well drilling muds and, sprayed on paper cartons, makes them impervious to such light oils as cleaning fluids.

Pectinum, a highly refined form of citrus pectin, is used in the treatment of dysentery, burns, and wounds. It is being studied as a substitute for blood or blood plasma in transfusions for the treatment of shock.

Finally, after all these ingredients are extracted, the pulp residue is dried and is converted into orange meal, a nutritious feed for cattle.

TOOLS for Electricians at War

Nerve centers for our intricate war machine are the electrical systems... motors, generators, and accessories of every size and type... from midjets concealed in automotive equipment, to giant portable power plants that serve a roving army.

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Tools are vital to Victory. Buy only for essential use. Stanley Tools, Division of The Stanley Works, New Britain, Conn.



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Will you come along? *you bet you will*

IT'S EARLY on an autumn morning sometime after Victory. A couple of your neighbors stop at your door. Dew shines on their boots. Their guns gleam, and you hear the muffled click of shells in their pockets as they move. They grin. You grin. "Ready?" they ask. "Right with you," you say. You slip into your jacket . . . you pick up your new H&R gun—the gun you've always dreamed of, well-balanced, beautifully finished, a top-notch performer in every way . . . and you're off on the hunt . . .

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Send my free copy of the H&R Reising Submachine Gun Manual.

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Annapolis at War

(Continued from page 11)

ship." Then he marches down the stairs ("ladder") and returns to his room at 8:45 for an hour of study.

At 10:05 he marches to Ward Hall for ordnance and gunnery, returning to Bancroft Hall at 11:05 for another hour of study. From 12:05 to 12:20 is "shine up" time for noon mess. Perhaps he exchanges gossip—"scuttlebutt"—with his roommate. The latest scuttlebutt is that four prospective plebes assigned to the academy from the fleet are holders of medals won in action. A plebe with a Navy Cross! The midshipmen realize that this is Annapolis at war.

The regiment, composed of all regular midshipmen, meets in "meal formation" before Bancroft Hall at 12:25 and marches to lunch in the great dining hall. Lunch is over at 1 o'clock and at 1:15 the midshipman marches to a laboratory class in electrical engineering, known as "juice." Marine engineering is "steam"; physics and chemistry are "skinny," languages "dago," history and English "bull."

His class in electrical engineering may be conducted around the latest Sperry gyro-compass. The laboratory equipment is the best in the world, for the officers insist that a midshipman must be trained with the best machines found on the newest warships. Occasionally the midshipmen are taken on tours of the Engineering Experiment Station located at the academy and operated by the Bureau of Ships in Washington.

"Juice" is over at 2:15. Following an hour of study, he reports for drill from 3:30 to 4:35. Then he is free for recreation until mess at 7 p.m. If he isn't on a varsity team, he will probably participate in intramural sports organized within the four battalions of the regiment. These include swimming, wrestling, boxing, basketball, fencing, tennis, soccer and others. The intramural program requires more than 4,000 team members during the year. Many midshipmen use part of the recreational period to work out on the obstacle course on Farragut Field that is a challenge to any prospective naval commando.

His evening meal is over by 7:30. He is free until the evening study period at 8:15. This ends at 9:50. Taps are at 10:05.

Throughout the midshipman's day he is subjected to rigid discipline for "he who would command must first learn to obey." He is taught respect for senior officers. If he is hurrying across the yard and wishes

(Continued to page 160)

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If you have a Ford "T" coil lying around, or can get one at any Ford dealer, auto parts store or garage, HERE'S AMAZING NEWS! You can now build your own electric fence unit that will charge up to 12 miles of wire fence, more than enough for the average farm. The Power Fence Company cannot get coils because of priorities, and is faced with the necessity of junking thousands of brand-new electric fence units at great loss of vital materials, or else selling them out at once, regardless of profit or loss, to anyone who can supply their own coil. Take advantage of this "Once-In-A-Blue-Moon" offer!

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Annapolis at war is the link between a glorious naval tradition steeped in glamor and a present that is as real as an anti-aircraft gun. While they revere the past, the academy leaders make sure that it does not overshadow a brilliant present. The midshipmen are inspired by ceremonies for returning naval heroes who are cited for bravery and decorated with the Distinguished Service Medal, the Navy Cross, or Silver Star. Distinguished alumni who have returned to address the men in Mahan Hall are Admirals Thomas S. Hart, William F. Halsey, H. E. Yarnell and W. S. Standley. Capt. Dixie Kiefer was awarded the Navy Cross and the Distinguished Service Medal for heroism and outstanding service as executive officer on the Yorktown. Comdr. H. B. Jarrett received the Navy Cross as commanding officer of a destroyer in the Battle of the Coral Sea. Lt. Comdr. T. W. Davison, who fought through the Bataan campaign, was awarded the Navy Cross and the Presidential Unit Citation.

In the museum are the damaged ensign that flew from the U.S.S. Shaw at Pearl Harbor and the flag of the Boise, flown during the battle of Cape Esperance. In a glass case is a Japanese pistol and a samurai sword captured on Makin Island by Lt. Col. E. F. Carlson of the Marine Corps and presented to the museum by Admiral C. W. Nimitz, commander in chief of the Pacific fleet.

Every phase of life at the academy—from classroom recitations to gunnery drill, from combat tactics to museum exhibits—instills in the midshipmen a fighting spirit and an eagerness to master his training and join the fleet. When they talk about the war, they speak with deep pride of our navy's record in the Pacific. But they'd like the Japs to know that the famous words of America's first naval hero, John Paul Jones, ring true today as they did in 1779—"I have not yet begun to fight."



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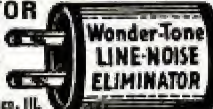


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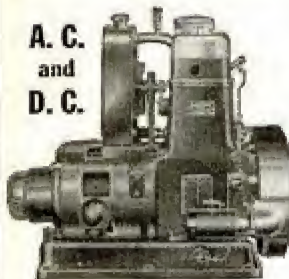
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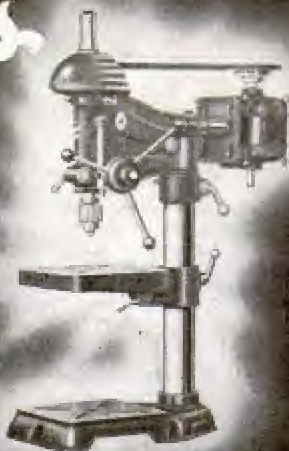
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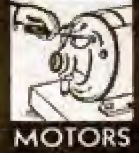
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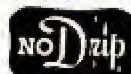
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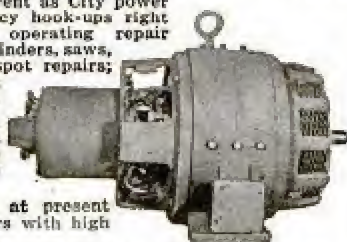
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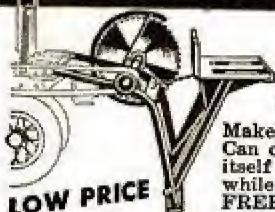
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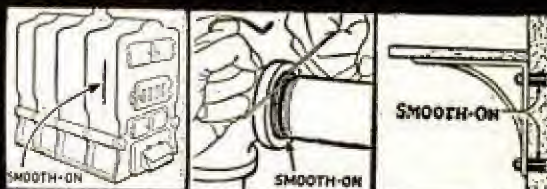
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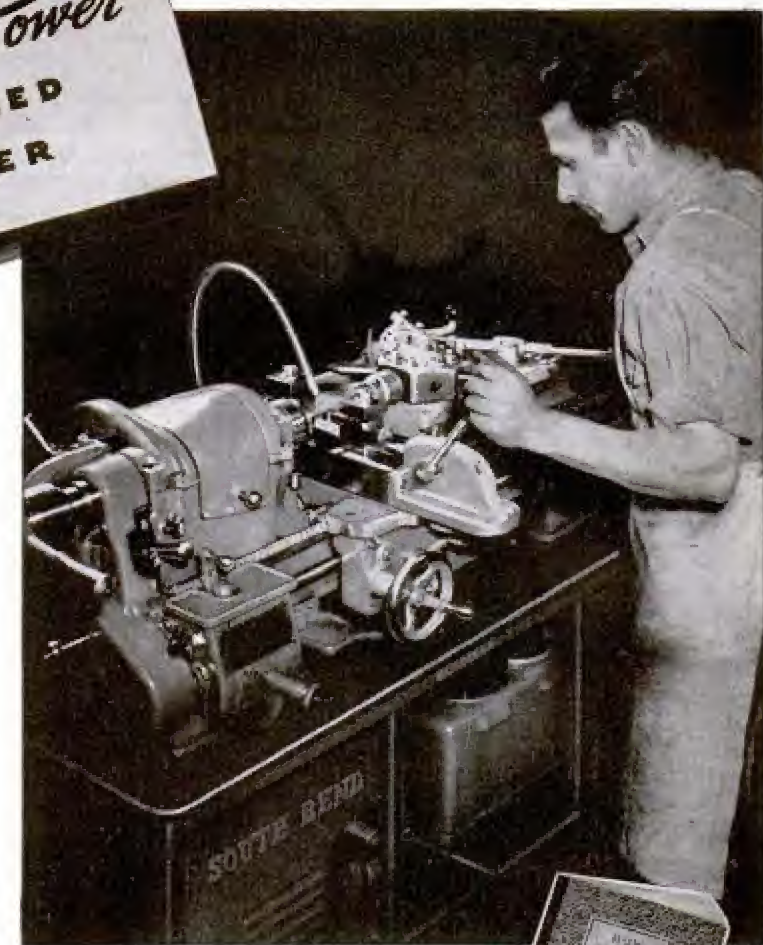
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